RECENT POPULATION TRENDS IN SOUTH ASIA

Proceedings of the Conference

New Delhi 1983

Edited by

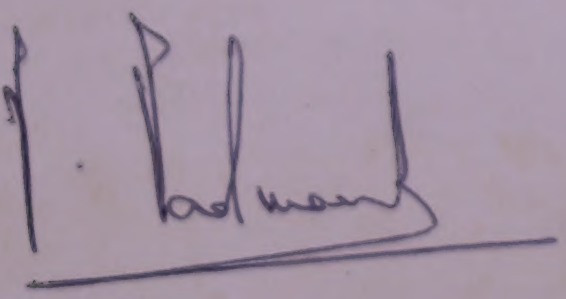
P. PADMANABHA

LEEJAY CHO

ROBERT D. RETHERFORD

12811
CLIC-
CPHE

SOCHARA
Community Health
Library and Information Centre (CLIC)
Centre for Public Health and Equity
No. 27, 1st Floor, 6th Cross, 1st Main,
1st Block, Koramangala, Bengaluru - 34
Tel : 080 - 41280009
email : clic@sochara.org / cphe@sochara.org
www.sochara.org



RECENT POPULATION TRENDS IN SOUTH ASIA

Proceedings of the Conference
New Delhi 1983

Edited by

P. PADMANABHA
LEEJAY CHO
ROBERT D. RETHERFORD

RECENT POPULATION TRENDS IN SOUTH ASIA

Proceedings of the Conference

New Delhi 1983

Edited by

P. PADMANABHA

LESLEY CHO

ROBERT D. RETHERFORD

DEM-130
12811 N83

PREFACE

The recent round of population censuses in the Asian region has attracted both national and international interest and attention that goes beyond mere numbers and extends to the social and economic implications of population size, structure and growth. There have, however, been few opportunities to exchange information or share experiences within the region on these issues. The census conferences organized periodically by the East-West Population Institute, Honolulu, have provided a regional forum for the discussion of census organization and methodology, but such large conferences necessarily have some limitations. In particular, they often do not allow in-depth discussions of problems peculiar to subregions or individual countries. The importance of such discussions scarcely needs any emphasis. Recognizing this need, the Office of the Registrar General, India, and the East-West Population Institute, collaborated in organizing a Conference on Recent Population Trends in South Asia, with the participation of representatives and experts from Bangladesh, India, Nepal, Pakistan and Sri Lanka. The participants also included other experts of international repute. The conference was held from February 2 to 8, 1983, in New Delhi. This report summarizes the discussions and includes the papers presented at the conference.

In organizing this conference both the Office of the Registrar General, India, and the East-West Population Institute have drawn heavily upon the assistance and goodwill of many organizations and innumerable personnel. In particular, thanks are due to the Government of India, the Director of the Institute of Applied Manpower Research, New Delhi, the Rockefeller Foundation and the U.S. Agency for International Development. The Government of India gave permission for the holding of the conference at New Delhi and provided the Office of the Registrar General, India with necessary support. The conference was held at the Institute of Appllied Manpower Research, New Delhi, and all necessary help and cooperation was readily extended by the Director of the Institute. The Rockefeller Foundation and the U.S. Agency for International Development provided generous financial support that enabled a large number of foreign participants to attend the conference. Organization of a conference of this nature requires the support and help of a large number of staff members and other personnel, and the debt the organizers owe them is in no way reduced by the inability to mention them all.

It is hoped that this conference has broken new ground in terms of regional cooperation in technical matters relating to population issues, and one looks, forward to such cooperative efforts increasing in the future. The Population Institute considers this conference as a further step toward meeting its mandate of promoting better relations and understanding among the nations of the region,

and the Office of the Registrar General India has been an enthusiastic partner in this endeavour. It is hoped that the deliberations of the conference as presented in this volume will provide some insights into the dimensions of population issues in the countries of the region and will evoke the interest of all those concerned.

P. PADMANABHA,
LEE-JAY CHO,
ROBERT D. RETHERFORD

December 1983

CONTENTS

	Page No.
1. PREFACE	(i)
2. INTRODUCTION	1
3. PAPERS OF SESSION I	15—48
(i) Census Evaluation in Bangladesh—An Analysis of Post Enumeration Check of the 1981 Population Census—A.K.M. Ghulam Rabbani	17
(ii) Sample Registration System in India—P. Padmanabha	29
(iii) On Strengthening of Demographic Data Base in India—K.C. Seal and Suguna Kumari	35
(iv) Opportunities for Research and Analytical Work from the Available Demographic Data in India—Mahendra K. Premi	41
4. PAPERS OF SESSION II	49—184
(i) New Estimates of Infant and Child Mortality Levels and Trends in India—P.N. Mari Bhat	51
(ii) An Assessment of Fertility Trends in India—Tim Dyson and V. Somawat	67
(iii) Fertility Estimates for Sri Lanka derived from the 1981 Census—Kanthi R. Ratnayake, Robert D. Retherford and S. Sivasubramaniam	83
(iv) Parity Progression and Birth Interval Analysis in South Asia—Griffith Feeney and Mala Wijeyasekera	141
(v) Censored Cohort Parity Progression Ratios from Birth Histories—W. Brass and Fatima Juarez	147
(vi) Fertility Differentials in Pakistan : A Comparison of Two Surveys—Mohammed Irfan and Iqbal Alam	161
(vii) India's Demographic Trends—A Reassessment on the basis of 1981 Census—K. Srinivasan	173
5. PAPERS OF SESSION III	185—268
(i) Migration into the Terai Region of Nepal—Vidya Bir Singh Kansakar	187
(ii) Migration to Cities in India—Mahendra K. Premi	197
(iii) Patterns and Characteristics of In-Migrants in Metropolitan Settlements of Maharashtra and Andhra Pradesh—Manzoor Alam, K.N. Gopi and Manisha Mookherjee	217
(iv) The Regional Pattern of Urbanization and Economic Development in India—Rakesh Mohan	233
(v) Migration Patterns in Pakistan during 1970s: Evidence from the 1981 Census Data—Akhtar Hasan Khan and Mehtab S. Karim	251
(vi) Spatial Organization of the National Economy—with Special Reference to the Role of Market Towns and Production Centres—Lessons from Indian Experience—L.S. Bhat	263

Page No.

6. PAPERS OF SESSION IV . . . . . 269—320

(i) Utilization of the Labour Force in Pakistan—Some Structural Features—Nasra M. Shah and Ghulam Mujtaba Mirza 271

(ii) Changes in the Indian Work Force in the Recent Period—J. Krishnamurthy 285

(iii) Manpower Issues for the Nineties—A. K. Dasgupta 299

7. PAPERS OF SESSION V . . . . . 321—368

(i) A Perspective on Intergenerational Change in Pakistan : Educational Attainment and Marriage Timing—Peter Smith, Sabina S. Syed and Mehtab S. Karim 323

(ii) Demographic Evaluation of India's Family Planning Programme—K. Sivaswamy Srikantan and K. Balasubramanian 335

(iii) Population Policy and Problems in Implementation—S. S. Nair 351

(iv) Marriage System and its Impact on Family Formation and Family Planning—Kanti Pakrasi . 357

8. PAPERS OF SESSION VI . . . . . 369—394

(i) On the Relationship between Landholding and Fertility (with Special Reference to Bangladesh)—Mead Cain 371

(ii) Population and Rural Infrastructure (with Special Emphasis on Implication of Population Growth for Development Process)—P.B. Desai 379

(iii) Population Growth and Agricultural Development in North India—Robert E. Evenson . 383—394

INTRODUCTION

Most of the countries of the Asian region conducted a census during 1980-81. The results of these censuses are of particular interest since they are expected to reflect the influence that recent policies of direct intervention in fertility behaviour and rapidly expanding health infrastructure might have had on population growth and structure. Such policies have been implemented in most of the countries of the region but their results in the South-Asian zone, in particular in Bangladesh, India, Nepal, Pakistan and Sri Lanka are of special interest for well-known reasons.

The populations of these five countries account for about 19.6 per cent of the population of the world and about 35 per cent of that of Asia, and range from 14 million in Nepal to about 684 million in India. The following statement indicates the population of these countries according to the last three censuses :

Country	Census Year	Census Date	Population	Average Annual Inter-eensal Growth Rate (%)
Bangladesh	1961	1.IX.61	50,840,235	
	1974	1.III.74	71,479,071	2.7
	1981	5.III.81	87,119,965	2.8
India	1961	I.III..61	439,234,771	
	1971	1.IV.71	548,159,652	2.2
	1981	1.III.81	683,810,051	2·2
Nepal	1961	22.VI.61	9,412,996	
	1971	22.VI.71	11,555,983	2.2
	1981	22.VI.81	15,020,451	2.6
Pakistan	1961	1.II.61	42,880,378	
	1972	16.IX.72	65,309,340	3.6
	1981	1.III.81	84,253,644	3.0
Sri Lanka	1963	8.VII.63	10,582,064	
	1971	9.X.71	12,689,897	2.2
	1981	17.3.81	14,850,001	1.6

All of these populations show high growth rates and are expected to contribute to a great extent to the population growth of Asia. It is against this background that it was considered useful to hold a conference to review certain important aspects of the population scene in South Asia, in particular the countries of Bangladesh, India, Nepal, Pakistan and Sri Lanka. The "Conference on Recent Population Trends in South Asia" was accordingly organized jointly by the Office of the Registrar General, India and the East-West Population Institute, East-West Centre, Honolulu, at New Delhi from 2 to 8 February, 1983. The participants included representatives from the countries concerned and other experts of international repute. The list of participants is given in Annexe 1.

The main purpose of the conference was to review the census operations and census results in each of the countries and to consider some broad population issues in identified areas of interest. The conference was expected to serve as a forum for the exchange of experiences among the participating countries regarding census taking and use of census data, and provide an opportunity for interaction of policy makers with the producers of census data and research workers. The deliberations of the conference were expected to stimulate greater utilization of relevant data from all available sources for the better understanding of population issues.

The conference was inaugurated by Mr. P. Venkatasubbiah, Minister of State for Home Affairs, Government of India, who expressed the hope that the deliberations of the conference would provide fresh understanding of the issues involved. The speech of the Minister is reproduced in Annexe 2.

The conference was organized in six sessions and one panel discussion. The subjects covered in these were, broadly, the following:

Session	Topic
1	Experience in organization and methodology of the 1980 round of censuses; suggestions for the future management of censuses; the planned analysis and utilization of demographic data from census and other sources.
2	New estimates of fertility, mortality and growth based on census, survey and registration data; demographic assessment of progress of family planning and other population policies and programmes.
3	Urbanization, migration and areal patterns of population growth.
4	Employment, workforce and economic activity.
5	Marriage and family formation; family welfare.
6	Population, resources and development.
Panel discussion	Comparative assessment of population policy and porgrammes.

The papers which were presented in each session are listed in Annexe 3. In Session IV Dr. (Mrs.) Devaki Jain made an intervention on women's participation in economic activity but did not present a paper. The paper by Dr. K. S. Srikantan was presented by Dr. S. S. Nair, while the paper by Dr. Kanti Pakrasi was not presented since he could not attend the conference. The conference was assisted by rapporteurs from the Office of the Registrar General, India.

The conference, as mentioned earlier, was intended to serve as a forum for exchange of experiences; no formal conclusions were arrived at, nor recommendations evolved. It was, however, considered useful to publish the background papers for wider disseminations evolved. It was, however, considered useful to presented fully, this introductory chapter presents only brief summaries of each session and there has been no attempt to discuss each paper in detail. However, there were no formal presentations regarding the censuses in the region in the form of papers. Therefore, the oral presentations on this topic have received more attention in this introductory chapter.

In the first session, descriptive accounts of the organization of the 1981 round of censuses in Bangladesh, India, Nepal, Pakistan and Sri Lanka were presented by the Census Commissioners.

The first population census of independent Bangladesh was held in February 1974. The second census was conducted in March 1981. The 1981 census made significant improvements over the earlier censuses in terms of coverage, methodology, management and analysis of data. The 1981 population census for Bangladesh was conducted in two stages. The first stage, which consisted of a household enumeration, was held from 6th to 8th March 1981, and the population count was obtained at this stage. During these operations, a short form was canvassed. A sample census was also conducted as the second phase, during which a longer form was canvassed.

India, as is the case of the other countries mentioned herein, has had a long tradition of census taking for over 10 decades now. The 1981 census of India was conducted in two stages. The houselisting operations were held in 1980 while the actual enumeration of the population took place from the 9th of February to the 28th of February 1981, followed by a revisional round from the 1st to 5th of March.

The 1981 census in Nepal consisted of two stages. During the period March—May 1981 a household schedule was filled up to serve as a control form for the canvassing of the individual questionnaire itself. The enumeration of the population through the individual questionnaire was from the 1st to the 21st of June 1981. On the last day of this enumeration period, the homeless persons and institutional households were canvassed and adjustment made for births and deaths so as to arrive at the population of the country as on the 21st of June 1981.

In Pakistan, the 1981 census consisted of two stages. The first stage was a full-fledged housing census conducted from 1st to 15th December 1980, three months prior to the population census itself. The population census in Pakistan was conducted from 1st to 15th March 1981 when two questionnaires were canvassed, namely, a long and a short questionnaire.

In Sri Lanka the 1981 census was conducted in two stages. A preliminary census was conducted from 1st to 10th of March 1981, during which information on the census schedule was entered by the enumerators. The second stage, or what is called the final census, was taken between 6 p.m. and 12 midnight on 17th March 1981. The final enumeration was meant to check and update the information obtained at the preliminary enumeration carried out in the first stage.

The censuses in these countries are either de jure, de facto or a combination of both.

Bangladesh adopted the de facto basis for enumeration on the ground that this was simpler to carry out in the field and that it tended to reduce cost, according to the census authorities of Bangladesh. The rural-urban differentiation was maintained.

In the Indian census the enumeration was on an extended de jure basis. The enumeration covered persons who could be considered as normal residents in a given household, on the basis of certain set criteria. The enumeration covered normal residents present in the household during the enumeration period of 9—28th February 1981; normal residents present in the household during part of the enumeration period but not present at the time of the enumerator's visit; normal residents not present at the time of the enumerator's visit but expected to return before 28th February 1981; and visitors present in the household who were away from their place of usual residence during the entire enumeration period. In India also, the rural-urban differentiation was maintained, with urban areas defined on the basis of notifications creating municipalities, notified area committees and similar bodies and places with certain predominant nonagricultural working characteristics.

In the 1981 census of Nepal, de jure concept of enumeration was adopted. There was no definition of an urban area as such, but all town panchayats were classified as urban. The rural-urban differentiation was maintained on this basis.

In Pakistan, at the 1981 census, a de facto cum de jure approach was adopted. The rural urban differentiation was also maintained.

In the 1981 census of Sri Lanka, the enumeration was in effect on a de facto basis since the final enumeration stage consisted of arriving at the population of a given housing unit on this basis. Sri Lanka has also maintained the rural-urban differentiation.

All the countries under consideration combined houselisting as part of the total census operation either just before or along with the census as such. In Bangladesh the houselisting operations were combined with the census. In India the houselisting operations were a distinct and separate operation carried out in 1980. In Nepal, the canvassing of the household schedule was combined with a control form for the purpose of census taking. Pakistan, unlike the other countries under consideration, conducted a fullfledged housing census, as mentioned earlier, prior to the population census. Sri Lanka also carried out a houselisting operation, called a census prelisting of housing units.

In all the countries the census operations were preceded by updating the list of towns and villages to ensure that no settlement was omitted.

Mapping was a basic feature of the census operations in all these countries, except Sri Lanka. No maps have so far been used in the Sri Lanka census for the demarcation of census blocks, but it is stated that the absence of such maps would not have affected the census coverage since particular care was taken to prepare the list of housing units during the pre-listing operation.

Bangladesh conducted four pretests meant to help finalize the design and format of the census questionnaires and test both the content and quantum of the work. Apart from the four pretests, a pilot census was conducted 9 months prior to the actual census in order to test and finalize the field procedures. In India two pilot studies were carried out to test the questionnaires with particular reference to the questions on work characteristics, and this was followed by two pretests. The census questionnaries were modified on the basis of the experience gained in these pretests. In Nepal a pilot census was conducted in 1979 in six districts selected for this purpose from the three geographic regions of the country. Within each district certain panchayats were selected. On the basis of the results of the pilot census, the questionnaires and instructions for enumerators were finalized. In Pakistan also the questionnaires and instructions were pretested before finalization. In Sri Lanka, too, a number of field trials were taken followed by a pilot census to test procedures and questionnaries. The pilot census in Sri Lanka was carried out in 80 census blocks and, based on the analysis of the results from it, the questionnaire and instructions were finalized.

In the Bangladesh census of 1981, a household book was canvassed over three days, and this was the short form. This operation was followed by sample census, tried for the first time in this census. This sample census covered 0.6 per cent of the households and was complementary to the main census. At the sample census a more detailed questionnaire was canvassed. For the canvassing of the short form, students and the unemployed were drafted, but the sample survey was carried out with selected enumerators in order to ensure quality.

In India, during the houselisting operations a houselist form was canvassed, and at the enumeration itself two forms were canvassed, namely a Household Schedule and an Individual Slip for each person, which were interlinked. The Household Schedule was completed for each household, and one Individual Slip was completed for each person within the household. These forms collected what might be called universal information for the entire population. In addition, in a 20 per cent area sample two further sets of questions were canvassed relating to migration and fertility. In the Indian census of 1981, a sample census has been tried out for the first time on the basis of an area sample for the collection of detailed information on specified characteristics.

In the 1981 census of Nepal, two schedules were canvassed, namely, a Household Schedule and an Individual Schedule. The Household Schedules provided a list of all households living in the various wards of each Panchayat, as well as a few socio-economic characteristics pertaining to each household. The principal purpose of this household listing was to ensure completeness of coverage of all households in an enumeration area. The Individual Schedule was canvassed for collecting demographic and socio-economic characteristics of each person.

In the 1981 census of Pakistan, a long questionnaire consisting of 24 questions was canvassed for a 10 per cent area sample of the population selected on the basis of probability proportional to size while a short questionnaire consisting of 11 questions was canvassed for 90 per cent of the population.

In Sri Lanka the census schedule consisted of 21 questions and was canvassed for the entire population. Four additional questions with regard to place of birth and migration and 12 additional questions on housing were canvassed on a 100 per cent basis in urban areas and on a 10 per cent basis in rural areas, with census blocks as the primary sampling units. Within each sample block the additional questions were canvessed on a 100 per cent basis.

Except for Nepal, the attempt to collect specific information on the basis of sampling has been attempted in the countries of this region. The experience gained will be valuable in determining the methodology of census taking in future censuses, particularly in view of the increasing difficulties of carrying out large-scale censuses.

Post-enumeration surveys (or post enumeration checks) were carried out as a third phase of the total census operations. The Bangladesh PEC was conducted 16 days after the census count and consisted of 3 phases. The first was the field survey, the second was a headquarters matching operation, and the third was a follow-up operation for reconciliation. One hundred and fifty enumeration areas from the rural parts of the country and 100 from the urban areas were selected for the PEC. Rigorous instructions and training procedures and field control systems were adopted.

The 1981 PEC indicates that the net coverage error in Bangladesh is of the order of 3 per cent. It showed that incomplete count of household members is a critical source of undercount apart from complete missing of households.

In India, in keeping with past tradition, the PEC was carried out to assess the extent of omission and duplication in the population count. The main objective of the PEC was, therefore, to determine coverage error. Opportunity was also taken to measure errors in response, or content error, with regard to certain items such as literacy, whether one has worked any time last year and main work. A sample of 4,000 blocks was selected, spread out among the major states, and specified forms were canvassed by specially appointed

staff. The basic process was a re-enumeration followed by record match and reverification. The PEC in India was conducted between the 5th of March to 8th of April, 1981 i.e., a few days after the end of the revisional round of the 1981 census. The PEC indicates that there is a net undercount in the census of the order of 17.90 persons per thousand. The net omission rate is 17.10 for males and 18.85 for females. Rural-urban differences appear significant, with a net omission rate of 15 per thousand in rural areas as against 27.6 per thousand in urban areas. Enumeration in urban areas continues to be more difficult than in rural areas. This appears to be a common experience in all the countries under consideration.

In Nepal a post enumeration survey was conducted after the 1981 census but was limited to 55 out of 75 districts due to constraints of time and terrain. A two-stage stratified random sampling design was adopted. The census supervisors were used as the enumerators in the PES and the process consisted of enumeration and matching. The extent of error is not yet available.

The Census Evaluation Study in Pakistan was conducted from April to September, 1981 for estimation of coverage and content errors in respect of a few basic characteristics. This survey was not conducted in the Federally Administered Tribal Areas. The operations were conducted in two phases as usual. In the first phase, information was collected on those items included in the survey and reconciled with census records. In the second phase, unmatched events were verified in the field. The results are not yet available.

In Sri Lanka, following the 1971 practice, a PES was carried out in June and July 1981. The 1981 PES was designed principally to measure the extent of census coverage and to evaluate certain items. It also complemented a survey to estimate the completeness of birth and death registration. Results are not yet available.

Computerization has been increasingly adopted in the processing of census data by the countries referred to herein. In Bangladesh, optical mark sensing devices have been used, with the questionnaries themselves being adopted for optical reading. This has dispensed with key puunching, and by January 1983 about 93 per cent of the data had been transferred to tape. The entire tabulation was expected to be completed by June 1983, and it is proposed to make available to users tapes on 1 per cent national sample of households. In India also, there has been increasing use of computerization with the main innovation being the establishment of 14 regional centres for carrying out data entry from key to tape, with Central processing done in Delhi. The basic data, however, were generated manually. Socio-economic data is proposed to be generated on the basis of a 20 per cent area sample in due course. Nepal has acquired a new computer for the processing of census data and for other such statistical jobs. Also, data entry machines have been installed of the key to disc system to shorten time for preparation of input. The entire work is expected to take a year and a half. Computerization has been adopted in Pakistan also, and it is expected that this will help enormously in quick processing and dissemination of data. Sri Lanka has also increased computerization of census data, and with the adoption of computerization, tables have already been published on various characteristics.

In all the countries represented, special attention has been paid to the organizational side of the census in order to improve both coverage and quality. Particular attention has been paid to publicity measures, training, and supervision. It is recognized that these organizational measures are as important as the formulation of the questionnaire itself. It is also recognized that, beyond a point, the census operations should not be strained to meet excessive demands of highly specific nature.

Training is a tightly controlled exercise. Taking into consideration the number of enumerators in the field, training is generally a decentralized operation with various levels of trainers being themselves trained.

Publicity has also received considerable attention in all these countries since it is recognized that the census is very much dependent upon public involvement and response. With the availability of various media in addition to the printed word, publicity was on a more intensive scale this time since it included the use of television also.

In all these countries, an adequate census hierarchy was built up that had tight central control but nevertheless permitted operational freedom, given the time spans within which field operations had to be conducted. Monitoring systems were developed to keep a watch on the adequacy of training, the use of publicity in sufficient measure and, most importantly, to ensure that the enumeration itself went well. The scale of operations would necessarily vary by population size, but problems relating to management of records, their storage and their processing were largely similar.

Each census has its own peculiar problems, but certain issues always need particular attention. These relate to the difficulty of putting into the field a vast hierarchy of enumerators who are essentially drawn from either the open market or from other branches of government, the increasing reluctance of such hierarchies to get involved in operations that are not adequately compensated, the increasing apathy of the public to such large scale investigative operations, and the cost of printing and processing.

Generally speaking, the enumerators are drawn from within existing hierarchies of government. With the passing of time, it has been found that there is an increasing reluctance on the part of these hierarchies to undertake such work. In this connection it is recognized that honoraria payments or compensation for such work is generally not adequate. However, it is also evident that the census would become an extremely expensive exercise if adequacy of honoraria was necessarily a condition. It is in this context that

the census authorities of these countries have to consider seriously how best a vast organization of this nature can be built up at short notice for future censuses. Closely connected with this issue, is that relating to the system of enumeration itself. The increasing use of sampling is probably an answer to both reluctance of hierarchies and increasing cost. Here again, the critical issues are the adequacy of levels of presentation of data and what topics are appropriately enumerated on a sample basis. The census authorities of these countries need to pay increasing attention to these aspects as part of the planning for the next census.

With increasing computerization there are further issues relating to the editing principles to be adopted and availability of data tapes to users. To some extent, the increasing use of the computer increases, in turn, the possibility of complex cross tabulations which the data may not quite be able to bear either in terms of quality or adequacy. These are additional issues that must be taken into consideration in planning the future censuses in the region.

The improvement of the efficiency of the census operations has been a constant endeavour of the authorities concerned, and evaluation has now become a feature of the operations, particularly through post enumeration surveys. As an example of such an effort, the Bangladesh experience of the Post Enumeration Check (PEC) was considered in some detail. The PEC is of great utility, quite apart from the indication it provides of the level of undercount (in the Bangladesh case of 3.1 per cent), since its findings help in improving the census operations. A careful evaluation of the PEC provides an administrative feel of some of the constraints that operate in the field. For example, deficiences in the reporting of some of the characteristics, especially age, may be due to the fact that the respondent is in most cases a single individual who answers on behalf of all the members of the household. The adequacy and quality of the training of the enumerators are also determinable through the PEC. The common experience has been that the greater the attention to training of enumerators, preparation of field maps and supervision, the better the coverage. The PEC was an essential step and must be viewed as part of census taking. This would ensure that the PEC is conducted regularly as part of the census count. The improvement of the evaluatory process of the census must be a matter of constant consideration by the census authorities concerned.

The census is now recognized as one of the largest and most important sources of demographic data. The census data provide a variety of information capable of extensive and intensive use. The utility of such data for research and analysis was illustrated in the paper relating to demographic data in India. Comparative, cross-country studies are also possible. The possibilities of ensuring increasing use of census data should be constantly explored.

In utilizing or evaluating census data, data from other sources are of interest. For example, the Sample Registration System of India (SRS) is now recognized as one of the important sources for vital rates. The SRS is one of the largest continuous surveys conducted in India and has been the subject of internal evaluation and independent appraisal. While there have been continuous efforts for the improvements of the system, it was felt that independent checks could also be developed.

The information available through the census, other surveys, and vital registration together constitutes a data base on demographic characteristics. The interrelationships between such different sources in the Indian situation was considered. It is apparent that the use of data from data sources requires a thorough consideration of inconsistencies which may be due to differences in definitions, survey procedures, etc. But the need and utility of drawing upon all available sources of demographic data scarcely call for emphasis. In this connection, the computerization of such data would enhance both utility and availability of such data.

The second conference session dealt with "new estimates of fertility, mortality and growth based on censuses, surveys and registration data and demographic assessment of programmes of family planning and other population policies and Programmes." The papers, seven in number, presented examples of the critical analysis of available data for the estimation of mortality and fertility levels and the application of new techniques such as the "own-children method" and analysis by parity progression. The need for improvement in survey techniques must be a constant consideration. In a situation where different surveys are undertaken on similar topics, the possibility of standardization of questionnaires, concepts and definitions, to the extent possible, would also be a worthwhile effort. Even while recognizing the constraints of comparability, the comparison of data from various sources is useful. Internal checks must be developed, subject to cost factors so that the results of a survey are more acceptable.

The third session dealt with "urbanization, migration and areal patterns of population growth." There were six papers presented at this session. Four were devoted to themes of urbanization and migration in India and two related to migration patterns in Nepal. Of the first four, two dealt with the urbanization process.

It was recognized that migration takes place due to a variety of reasons. In order to be able to analyze and study this process or to understand it better, migration data should be available in greater detail. It would be helpful if the possibilities of more detailed statistics, cross-classified with other variables, can be considered by the data generating agencies. Migration studies are important since they have both political and policy implications. The origin and destination of migrants, the reasons why they move, the skills they either bring or carry away, the remittances they make and many other aspects need continuous study and analysis. There are also sociological issues, such as the impact of the family when the main males migrate, that needs to be assessed.

The process of urbanization and migration are interlinked. However, urbanization merits study as a distinct phenomenon because it is dependent on and influenced by social and economic decisions in other sectors of the economy. These include investment decisions in industry and agriculture. In fact, analytical models support the view that locational decisions of investment can influence the process of urbanization and, therefore, further work in these areas is desirable.

The fourth session dealt with "employment, workforce and economic activity." Three papers were presented at this session and Dr. (Mrs.) Devaki Jain made a statement on the importance of data relating to women's involvement in work. Two papers present employment data from surveys and evaluate consistencies in comparison with data drawn from other sources. In interpreting such data, the criteria adopted for defining employment, unemployment and underemployment are important. In particular, the criterion of "hours of work" is a very sensitive one, especially in a situation of low productivity and long hours of work. Also, the biases in responses, depending on one's views on wage employment and self employment, affect the employment rates. It is clear that data have to be evaluated carefully before any firm conclusions can be drawn. Here again, there is a case for more extensive tabulation of census data on work characteristics.

The third paper, while considering the manpower implications of demographic data, argues that classifications based on social activity would be preferable to one based on economic activity. It was noted that there would be serious implications with regard to data needs if this were to be attempted.

The need for further work on female work participation was noted. Labour force surveys must ensure adequate coverage of females and children, and in-depth inquiries regarding inputs by females and children in domestic activities such as collection of fuel, fetching of water and child care are needed.

The fifth session dealt with "Marriage, Family Formation and Family Welfare." Four papers were contributed to this session of which three were presented by the authors. The fourth one by Dr. Kanti Pakrasi was not presented since he was unable to attend the conference. The first paper presented the experience of a limited survey conducted to examine relationships between social and family changes. It was noted that generalizations at the national level on the basis of such surveys would require careful evaluation of the results and methodology, including adequacy of sample size. Such studies are, however, useful to gain insight into the social and family relationships that prevail.

The other two papers were based on the Indian experience of the family planning programme. The family planning programme has to be implemented in conjunction with other socioeconomic programmes. In particular, the improvement in rural health infrastructure the literacy of women and community participation are important aspects that need continuous attention. Social values and institutions must also be moulded to be more in conformity with national goals on fertility.

The sixth session dealt with "Population, Resources and Development." Three papers were presented in the session. It was recognized that extreme caution has to be exercised in drawing any conclusions, especially when casual relationships are sought to be established. For example, the relationship between landholdings and family size cannot be evaluated in simple terms of security or demand for labour. Such studies are, however, useful to the extent that they establish the linkages between population and other factors. The study of population growth and agricultural development, for example, would yield not merely valuable data but also some policy guidelines. The latter may include indicators of the capacity of the agricultural sector to absorb labour and the other options that may be available to the policy maker for overcoming or meeting the relevant population issues. In fact, these are facets of the development process in which the understanding of the casual relationships with particular reference to fertility behaviour is important. In this process, the improvement of rural infrastructure is vital, but this has to be in conjunction with building up of local institutions. Development without community participation is likely to generate expectations without responsibility and have little influence on the existing social value system.

A panel discussion was held on the "Comparative Assessment of Population Policy and Programmes in Asia." The discussion was chaired by Dr. Lee-Jay Cho and the members were Dr. A.K.M. Rabbani of Bangladesh, Mr. J.S. Baijal of India, Dr. B.P. Upreti and Mr. S.B. Srivastava of Nepal, Dr. A.H. Khan of Pakistan and Mr. W.A.A.S. Peiris of Sri Lanka. Each of the panelists made a presentation of the main facets of the population policy in his country and this was followed by a general discussion.

In Bangladesh, it is recognized that the current high rates of growth have to be reduced and, therefore, there is a government commitment to the family planning programme. The programme has the twin objectives of limitation of family size and improvement of the quality of life of the people. It is expected to achieve a contraceptive use rate of 35 per cent by 1990 as against the current 18 per cent. It is hoped to achieve an NRR of unity by the year 2000. Programmes relating to health and sanitation are considered important parts of the policy, and particular attention is being paid to the improvement of the supply of safe drinking water. The thrust of the family planning programme is on motivation of women and community participation. It is recognized that women have an extremely important role and, therefore, there has been an increasing use of female field workers for motivation. It was expected that the population of Bangladesh would be about 113 million by 1990, about 130 million by 2000 and that it would stabilize around 160 to 180 million by the first quarter of the next century.

In India, four demographic goals have been set for achievement by the year 2000. These are a birth rate of 21 per 1000, a death rate of 9 per 1000, an infant mortality rate of 60 per 1000 and an annual growth rate of 1.2 per cent. It is recognized that to achieve these goals great efforts are called for not merely in family planning but also in associated fields such as maternal and child care, water supply, and education. Multiple approaches are being adopted for implementation of the programme. A cafetaria approach is adopted in providing family planning services, all hospitals and primary health centres are being equipped for making available family planning services and an integrated approach is being adopted with regard to providing of family planning services and maternal and child care. The extension services are being vastly expanded through the system of health guides and more intensive training of the traditional rural midwives regarding immunization programmes. Research is an important component of the policy and there is sensitive monitoring. It is now accepted that family planning should become a way of life and that there are issues beyond providing services as such. These include the enhancement of the status of women through improvements in educational levels, involvement in work and raising the age at marriage. The need to involve the community is also recognized.

In Nepal, a Population Commission has been set up to oversee and coordinate the implementation of population policy. A number of steps have been undertaken for enhancing the adoption of family planning in the rural areas. It is now stipulated that all doctors entering government service have to spend one year in the family planning programme. To a large extent, integration of the family planning programme with associated development sectors is being ensured and the Ministries concerned are being asked to keep the population aspect in focus in the formulation and implementation of their programmes. Improvement in the literacy of women is considered essential. By 1985, it is intended to provide free education to girls up to grade VIII as against the present primary level and enrolment of girls in schools should reach 45 per cent. About 20 per cent of district grants are linked with population activities, with reductions or enhancements in the grants based on annual performance being built in. Community participation is also being encouraged by allocation of funds for primary health care and primary education. By the year 2000, it is expected to reach a total fertility rate of 2.5.

Pakistan has one of the highest rates of growth in the region despite having comparatively high per capita income and high degrees of migration and urbanization. The family planning programme was launched in 1965, but by 1969 it was found that adoption of family planning was very little. In the 1970s, a motivational approach was adopted, particularly in the rural area, but the results continued to be disappointing. In 1980, the family planning programme has been taken up with renewed vigour with emphasis on establishment of family welfare centres and integrated package programmes. Employment opportunities are being provided to women in industrial centres where the family planning message will also be imparted. It is rather early to assess the results, and surveys are being undertaken to assess the impact.

In Sri Lanka, the role of family planning was recognized as early as the the 1950s and was accepted as a national policy in the mid 1960s. By 1966, the basic infrastructure had been provided. In 1977 the new government further strengthened the programme, particularly field services. The implementation of the policy now receives attention at the highest levels in government.

A general concensus emerged that the reduction of fertility cannot be viewed in simple input-output terms and that there were close links with other sectors of development. However, while recognizing the importance of the associated socio-economic variables, the need for continuing emphasis on family planning as such was noted. The effectiveness and acceptability of family planning is frequently improved when the programme involves the community. In this connection, the very useful role that voluntary agencies can play was acknowledged. The importance of involving women in the implementation was recognized as was also the need to improve their socio-economic status. Improvement in levels of literacy is another need that calls for urgent attention. Social measures aimed at raising the age at marriage are also necessary. With family planning now an integral part of population policy, the need to constantly improve both the data base and monitoring systems was emphasized. In this context, it was recognized once again that the census provides a valuable data base covering a wide spectrum of demographic, social and cultural characteristics of the population. In view of its importance as a data source over time, issues relating to coverage and quality need continuous identification and evaluation.

ANNEXE 1

Conference on recent population trends in South Asia
New Delhi—February 2—8, 1983

LIST OF PARTICIPANTS

1. Gp. Capt. B. B. Adlakha, Director (EDP), Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

2. Dr. Iqbal Alam, Senior Research Demographer, Pakistan Institute of Development Economics, Post box No. 1091, Islamabad, Pakistan.

3. Mr. J. S. Baijal, Additional Secretary, Ministry of Health & Family Welfare, Nirman Bhavan, New Delhi—110011, India.

4. Prof. L. S. Bhat, Indian Statistical Institute, Delhi Centre, 7, S.J.S. Sansanwal Marg, New Delhi—110016, India.

5. Mr. P.N. Mari Bhat, Graduate Student, Population Studies Centre, Graduate Group in Demography, Pennsylvania University, 3718 Locust Walk CR, Philadelphia 19174, U.S.A.

6. Mr. R.K. Bhatia, Deputy Director of Census Operations, Registrar General's Office, 2/A Mansingh Road, New Delhi—110011, India.

7. Prof. William Brass, Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine, Kappel Street, London WCIE 7HT, U.K.

8. Dr. Mead Cain, Associate, Centre for Policy Research. The Population Council, One Dag Hammarskjold Plaza, New York, NY 10017, U.S.A.

9. Mr. K.K. Chakravorty, Deputy Registrar General (Census & Tabulation), Registrar General's Office, 2/A Mansingh Road, New Delhi—110011, India.

10. Dr. Lee-Jay Cho, Director, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

11. Dr. A.K. Dasgupta, Adviser, Institute of Applied Manpower Research, Indraprastha Estate, New Delhi—110002, India.

12. Prof. P.B. Desai, Institute of Economic Growth, University Enclave, Delhi—110007, India.

13. Mr. M.M. Dua, Senior Reserach Officer, Registrar General's Office, 1st Floor, North Wing, Sewa Bhavan, Ramakrishnapuram, New Delhi-110022, India.

14. Dr. Timothy P.G. Dyson, Lecturer in Population Studies, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, U.K.

15. Prof. Robert E. Evenson, Economic Growth Centre, Department of Economics, Yale University, Box 1987, Yale Station, New Haven, Connecticut 06520, U.S.A.

16. Dr. Griffith M. Feeney, Research Associate, East-West Population Institute East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

17. Mr. M.L. Gulati, Deputy Director, Registrar General's Office, 2/A Mansingh Road, New Delhi—110011, India.

18. Dr. M. Holla, Joint Registrar General (Vital Statistics), Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

19. Dr. Mohammad Irfan, Senior Research Economist, Pakistan Institute of Development Economics, Post Box 1091, Islamabad, Pakistan.

20. Dr. K.P. Ittaman, Senior Research Officer, Registrar General's Office, 1st Floor, North Wing, Sewa Bhavan, Ramakrishnapuram, New Delhi—110022, India.

21. Dr. (Mrs.) Devaki Jain, Institute of Social Studies Trust, M-1, Kanchanjunga, 18, Barakhamba Road, New Delhi—110001, India.

22. Mr. M.K. Jain, Senior Research Officer, Registrar General's Office, 1st Floor, North Wing, Sewa Bhavan, Ramakrishnapuram, New Delhi—110022, India.

23. Dr. Vidya Bir Singh Kansakar, Associate Research Officer, Centre for Economic Development and Administration, Post Box 797, Kathmandu, Nepal.

24. Dr. Mehtab S. Karim, Research Fellow, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

25. Prof. J.C. Kavoori, Family Planning Foundation, 198 Golf Links, New Delhi—110003, India.

26. Dr. Akhtar Hasan Khan, Census Commissioner, Population Census Organisation, Statistics Division, Government of Pakistan, P.O. Box 1026, Islamabad, Pakistan.

27. Dr. J. Krishnamurthy, Delhi School of Economics, University Enclave, Delhi—110007, India.

28. Dr. Toshio Kuroda, Project Director, Population Research Institute, College of Economics, Nihon University, 3-2, Misaki-cho, 1-chome, Chiyoda-ku, Tokyo, 101, Japan.

29. Dr. Boonlert Leoprapai, Chief, Population Division, Economic and Social Commission for Asia and the Pacific, United Nations Building, Rajadamnern Avenue, Bangkok-2, Thailand.

30. Ms. Janet F. Mason, Administrative Officer, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

31. Dr. W. Parker Mauldin, Senior Scientist, Population Sciences Division, The Rockefeller Foundation, 1133 Avenue of the Americas, New York, NY 10036, U.S.A.

32. Mr. G. Mujtaba Mirza, Joint Census Commissioner, Government of Pakistan, Interior Division, 16, Almarkaz Building, Islamabad, Pakistan.

33. Dr. Rakesh Mohan, Senior Consultant (Perspective Planning), Planning Commission, Yojana Bhavan, New Delhi—110001.

34. Miss Manisha Mookherjee, Assistant Editor, Osmania Journal of Social Sciences, Osmania University, Hyderabad, India.

35. Dr. N.G. Nag, Deputy Registrar General (Social Studies), Registrar General's Office, 1st Floor, North Wing, Sewa Bhavan, Ramakrishnapuram, New Delhi—110022, India.

36. Dr. S.S. Nair, Director (Evaluation), Ministry of Health & Family Welfare, Nirman Bhavan, New Delhi—110011, India.

37. Mr. K.S. Natarajan, Assistant Registrar General (Demography), Registrar General's Office, 4/19, Asaf Ali Road, New Delhi—110002, India.

38. Mr. P. Padmanabha, Registrar General, India, 2A, Mansingh Road, New Delhi—110011, India.

39. Mr. V.P. Pandey, Deputy Registrar General, India, Registrar General's Office, 2A, Mansingh Road, New Delhi—110011, India.

40. Mr. Wettasingha A.A.S. Peiris, Director of Census and Statistics, Department of Census and Statistics, Government of Sri Lanka, 6, Albert Crescent, Post Office Box 563, Colombo 7, Sri Lanka.

41. Dr. M.K. Premi, General Secretary, IASP, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Mehrauli Road, New Delhi—110067, India.

42. Mr. R.K. Puri, Deputy Director of Census Operations, Registrar General's Office, 4/19, Asaf Ali Road, New, Delhi—110002, India.

43. Dr. A.K.M. Ghulam, Rabbani, Director General, Bangladesh Bureau of Statistics, Secretary, Statistics Division, Ministry of Planning, Government of Bangladesh, Bangladesh Secretariat, Dhaka 2, Bangladesh.

44. Mr. N. Rama Rao, Assistant Registrar General (Census & Tabulation), Registrar General's Office, 2A, Mansingh Road, New Delhi—110011, India.

45. Dr. Lakshmi Kanthi Ratnayake, Professor of Geography, Ruhuna University, Mataro, Sri Lanka.

46. Dr. Robert D. Retherford, Assistant Director and Research Associate, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

47. Dr. B.K. Roy, Deputy Registrar General (Map), Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

48. V.P. Rustagi, Deputy Director of Census Operations, Registrar General's Office, 2A, Mansingh Road, New Delhi—110011, India.

49. Dr. K.C. Seal, Director General, Central Statistical Organisation, Sardar Patel Bhavan, Parliament Street, New Delhi—110001, India.

50. Dr. Judith Seltzer, Demographer, Office of Population, Agency for International Development, Washington, D.C. 20523, U.S.A.

51. Dr. Nasra M. Shah, Research Fellow, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

52. Mr. O.P. Sharma, Deputy Director of Census Operations, Registrar General's Office, 2A, Mansingh Road, New Delhi—110011, India.

53. Mr. Sunil Sinha, Senior Research Officer, Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

54. Mrs. S. Sivasubramaniam, Statistical Officer, Department of Census and Statistics, Government of Sri Lanka, 6, Albert Crescent, Post Office Box 563, Colombo 7, Sri Lanka.

55. Dr. Peter C. Smith, Research Associate, East-West Population Institute, East-West Centre, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

56. Mr. James Spitler, Staff Member, Foreign Demographic Analysis Division, U.S. Bureau of Census, Washington, D.C. 20233, U.S.A.

57. Dr. K. Srinivasan, International Institute of Population Studies, Govandi Station Road, Deonar, Bombay—400088, India.

58. Mr. K. N. Shrinivasan, Assistant Registrar General, Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

59. Mr. Shyam Biharilal Srivastava, Director General, Central Bureau of Statistics, Ramshah Path, Kathmandu, Nepal.

60. Mr. V.S. Swamy, Assistant Registrar General, Registrar General's Office, West Block I, Ramakrishnapuram, New Delhi—110022, India.

61. Dr. Bedh Prakash Upreti, Secretary, National Commission on Population, Secretary, His Majesty's Government Post Office Box 1118. Singh Durbar, Kathmandu, Nepal.

62. Ms. Mala Shirani Wijeyesekara, 31, Davison Road, Colombo 5. Sri Lanka.

Note: Papers were presented on behalf of the following invitees.

1. Dr. Manzoor Alam, Director, Area Study Centre, Osmania University, Hyderabad, India.
2. Dr. Kanti Pakrasi, Head, Anthropometry and Human Genetic Unit, Indian Statistical Institute, Calcutta, India.
3. Dr. K. Sivaswamy Srikantan, Population Research Centre, Ghokale Institute of Economic and Politics Pune, India.

ANNEXE 2

Inaugural Speech by Mr. P. Venkatasubbiah, Minister of State for Home Affairs, Government of India

Dr. Lee-Jay Cho, Mr. Padmanabha, distinguished delegates, ladies and gentlemen.

It gives me great pleasure to be here with you this morning and I welcome you all to this conference on "Recent Population Trends in South Asia." I am glad to note that the East-West Population Institute, East-West Center, Honolulu is collaborating with the Office of the Registrar General, India in holding this important conference and I thank, on behalf of the Government of India and on my own behalf, the East-West Population Institute for doing so.

I understand that you will be examining and comparing the latest available population data during the next one week and analyse population changes that have taken place in our region in the past decade and discuss the questions that are important in policy making and development planning. I am happy to note that experts in the field of population from the East-West Center and other countries in the region will be exchanging data and experience for identifying issues facing individual countries as well as South Asia as a whole with regard to population, on the basis of the latest available data. I am sure your findings will throw a flood of light on the different facets of the population problem which poses a massive challenge to the resurgent countries in Asia.

The countries represented here constitute an important area in Asia and play a major role in the international arena. Considerable data have been collected on fertility, mortality and migration levels over the past 10 years which reveal that progress has been made in reducing the growth rates in some of the countries of the region. Figures indicate that the overall population growth rate of the region declined between 1970 and 1980 despite slight differences between the levels of growth among the countries. However, during this period, the population has grown enormously in absolute numbers due to a large base population. The major problem facing most of us is to combat poverty arising out of over-population. Poverty is a condition characterised by hunger and malnutrition, lack of education, unemployment, lack of health care, sub-standard housing and poor sanitation and general living conditions. These problems have a close link with the size of the population. Another important fact which one should take note of in this regard is the imperative necessity to ensure the physical quality of the population by providing better nutrition, housing, education, sanitation and the like.

Population is no longer deliberated upon in isolation. Population policy has now entered the domain of social policy and planning. Today the inter-relationship between demographic factors and policies connected with education, health, housing, food, agriculture, industrialisation and employment is very well recognised in all these countries. Population planning is now increasingly considered as an integral part of overall development planning.

In our country, population polices and development policies are integrated to a large extent. The family welfare programme has been considerably effective in mitigating growth rates. There is, however, no room for complacency. The size of the population of our country—685 million as revealed by the 1981 Census—its age structure and other features, including infant mortality rates have called for continuous monitoring and attention in policy formulation. The population policy of our country has a two-fold aim—firstly, expansion and improvement of public health services and the reduction of the incidence of mortality and diseases; secondly, the birth rate, and consequently the growth rate of the population, is proposed to be reduced in a reasonable span of time through improvement in living conditions of the people. Apart from reducing fertility, the improvement in the living conditions are expected to enhance the quality of life of the people. In the words of our Hon'ble Prime Minister, "Every man, woman and child must have a better chance in life in terms of food, shelter, education, employment and physical, aesthetic and the spiritual fulfillment." This will be possible only if the growth of population does not outstrip the growth of the economy. Our people are continuously educated and encouraged to understand the importance of small families. We have set for ourselves a long term goal for reducing the net reproduction rate to unity by 2000 AD by bringing down the crude birth rate from its current level of about 33 per thousand to 21 per thousand and crude death rate from the current level of 14 per thousand to 9 per thousand by that year. These targets call for great efforts and we are confident that we will be able to achieve these goals.

The deliberations in this conference and the recommendations emerging therefrom are bound to be of vital interest in today's context to all of us and to the Asian region in general.

I am very happy that New Delhi has been chosen as the venue for this conference. The distinguished participants from the various countries who have assembled here will, I trust, enjoy their stay in our country and I wish them a very happy and useful sojourn in India. I have great pleasure in inaugurating this conference and I wish your deliberations all success.

3—5 RGI/ND/84

ANNEXE 3

Papers

Session I: Experience in organization and methodology of 1980 round of censuses; suggestions for future management of censuses; the planned analysis and utilization of demographic data from censuses and other sources.

1.	Census Evaluation in Bangladesh—an Analysis of Post-Enumeration Check of the 1981 Population Census	A.K.M. Ghulam Rabbani
2.	Sample Registration System in India.	P. Padmanabha
3.	On Strengthening of Demographic Data Base in India.	K. C. Seal and Suguna Kumari
4.	Opportunities for Research and Analytical Work from Available Demographic Data in India	M. K. Premi

Mr. P. Padmanabha was the coordinator for this session.

Session II: New estimates of fertility, mortality and growth based on census, survey and registration data; demographic assessment of progress of family planning and other population policies and programmes.

1.	New Estimates of Infant and Child Mortality Levels and Trends in India.	P.N. Mari Bhat
2.	An Assessment of Fertility Trends in India	T. Dyson and Y. Somawat
3.	Fertility Estimates for Sri Lanka derived from the 1981 Census	Kanthi Ratnayake R.D. Retherford and S. Sivasubramaniam
4.	Parity Progression and Birth Analysis in South Asia	Griffith Feeney and Mala Wijeyasekera
5.	Censored Cohort Parity Progression Ratios from Birth Histories	William Brass and Fatima Juarez
6.	Fertility Differentials in Pakistan: A Comparison of Two Surveys	Mohammad Irfan and Iqbal Alam
7.	India's Demographic Trends: A Reassessment on the Basis of the 1981 Census	K. Srinivasan

Dr. Lee-Jay Cho and Dr. K. Srinivasan were the coordinators to this session.

Session III: Urbanization, migration and areal patterns of population growth.

1.	Migration into the Terai region of Nepal	V.B.S. Kansakar
2.	Migration to Cities in India	M.K. Premi
3.	Patterns and Characteristics of In-Migrants in Metropolitan Settlements of Maharashtra and Andhra Pradesh	Manzoor Alam, K. N. Gopi and Manisha Mookherjee
4.	The Regional Pattern of Urbanization and Economic Development in India	Rakesh Mohan
5.	Migration Patterns in Pakistan during 1970s: Evidence from the 1981 Census Data	A.H. Khan and M.S. Karim
6.	Spatial Organization of the National Economy, with Special Reference to the Role of Market Towns and Production Centres—Lessons from the Indian Experience	L.S. Bhat

Dr. Peter C. Smith and Dr. A.K.M. Ghulam Rabbani were the coordinators for this session.

Session IV: Employment, workforce and economic activity.

1.	Utilization of the Labour Force in Pakistan Some Structural Features	—Nasra M. Shah and G. Mujtaba Mirza
2.	Changes in the Indian Work force in the Recent Period	—J. Krishnamurty
3.	Manpower Issues for the Nineties	—A.K. Dasgupta

Dr. Bed Prakash Upreti and Mr. W.A.A.S. Peiris were the coordinators for this session.

Session V: Marriage, family formation and family welfare.

1.	A Perspective on Intergenerational Change in Pakistan: Educational Attainment and Marriage Timing	—Peter C. Smith, Sabina S. Syed and Mehtab S. Karim
2.	Demographic Evaluation of India's Family Planning Programme	— K. S. Srikantan and K. Balasubramanian

3. Population Policy and Problems in Implementation — S.S. Nair
4. Marriage System and Its Impact on Family Formation and Family Planning — Kanti Pakrasi

Mr. W.A.A.S. Peiris was the coordinator for this session.

Session VI: Population, resources and development

1. On the Relationship between Landholdings and Fertility (with Special Reference to Bangladesh) — Mead Cain
2. Population and Rural Infrastructure (with Special Emphasis on Implications of Population Growth for the Development Process) — P.B. Desai
3. Population Growth and Agricultural Development in North India — Robert E. Evenson

Dr. Akthar Hasan Khan was the coordinator for this session.

PAPERS OF SESSION I

CENSUS EVALUATION IN BANGLADESH: AN ANALYSIS OF POST ENUMERATION CHECK OF THE 1981 POPULATION CENSUS

A. K. M. GHULAM RABBANI

1. 1981 Population Census Programme of Bangladesh

The 1981 Population Census of Bangladesh was a significant improvement over the past censuses that had hitherto been carried out in the territory now comprising Bangladesh. This was possible because of a number of innovations that were built into the Census Programme on the basis of a number of pretests and pilot surveys and successfully carried through in the actual field operations. Some of the major innovations were:

(1) Carrying out the 100% count on a de-facto basis in three days compared to 21 days to one month in earlier censuses that were carried out either on a de-jure or a mixture of de-jure and de-facto basis.

(2) Combining the houselisting with head count as one operation instead of two separate operations as had hitherto been followed, thereby making linkages between housing and household information feasible.

(3) Adopting a short pre-coded questionnaire enumerated on a household basis in place of a large number of questions canvassed on individual basis in earlier censuses, leading to ease of field enumeration.

(4) Using a verbation training manual that ensured uniformity in training of field enumerators and supervisors and training at the grass-root level replicated through a minimum number of hierarchies, starting with a core of high level master trainers.

(5) Using a computerized field control system including computerized system of logistics and distribution of materials, thereby ensuring a smooth field operation.

(6) Extensive use of maps for delineating boundaries of enumeration areas both in urban and rural areas, thereby minimising the risk of over or under-count at the enumeration area boundaries.

(7) Use of local enumerators and supervisors with knowledge and familiarity about the enumeration areas leading to improvement in coverage and quality of enumeration.

(8) Using the extensive network of the permanent field offices and field personnel of the Bangladesh Bureau of Statistics (BBS) for logistics, field control, training of enumerators and supervisors in place of relying on ad-hoc field officers as in earlier censuses, thereby ensuring an overall smooth execution of field work.

(9) Carrying out intensive nationwide publicity through all the mass media particularly through television, radio, cinema halls and drum-beating in the rural areas that succeeded in arousing mass enthusiasm about the population census.

(10) Using machine readable precoded questionnaire developed and finalised through repeated field pre-tests that ensured ease of field enumeration, and facilitated error-free data conversion.

Earlier population censuses have always suffered from sizeable under-coverage. The degree of under-coverage in 1974 census was of the order of 9%, 7% in rural areas and 19% in urban areas. The 1961 under-coverage was around 8%. Besides under-coverage, the quality of enumeration was also not satisfactory. In the absence of properly conducted post enumeration check surveys, recourse had to be taken to indirect methods, often insufficient to judge the degree of under-enumeration and quality of past censuses including the 1961 and 1974 censuses. The 1981 census was the first census where a properly conducted direct post enumeration check (PEC) in the form of a small sample operation was systematically carried out as a part of the census programme to judge the degree of coverage and quality of enumeration of the major characteristics covered in the census.

This paper briefly describes that check and some of its broad findings. Indepth analysis of the PEC and its findings are being published by the BBS to which the reader is referred to for details.

2. Objectives of the PEC

The principal objectives of the PEC was to estimate the magnitudes of both positive (overcount) and negative (undercount) coverage errors and use the information to provide a population estimate net of coverage error for the nation and for the rural and urban components separately. Overcount would include erroneous enumeration of persons who were not living in the country on the census night (March 5, 1981), listing of persons who had died before census night, or persons counted more than once or recording names of fictitious persons. Undercount on the other hand would include both the omission of individual persons and whole households.

The other objective of the PEC was to provide indicators of quality of selected characteristics or information collected in the census. Both personal and housing characteristics were covered. The personal characteristics included age, sex, marital status, literacy, and highest grade completed. The housing characteristics were type of wall material, type of roof material and type of ownership/tenancy. The second objective was

accomplished by having the PEC enumerator independently collect the selected information in the same manner as was done in the census.

3. Principal consideration for the 1981 Population Census PEC

The PEC had to contend with two opposing considerations: To minimize bias in the estimation of census coverage, the PEC had to be kept as operationally independent from the census as possible; i.e. the time period before census and PEC should be sufficiently long. On the other hand, the longer the time period between census and PEC, the more difficult it is for the respondents to remember who actually stayed in the household on the census night. These opposing considerations make the evaluation of a de-facto census more difficult than a de-jure census. However, as an accurate recall of persons present in households on census night is basic to the estimation of a de-facto census coverage, this was given first priority.

An intervening period of two and one-half weeks between the census and PEC was finally decided on. This period was long enough to allow for all census enumeration books to be transferred from the field to the central storage facility at Dhaka. Thus, it was impossible for the PEC enumerator to copy any census work done by the census enumerator.

The PEC should also be manageable. The sample size for the PEC was large enough to provide estimates of census coverage at the national level by urban and rural break downs with reasonably low sampling errors, while at the same time it is not so large that control of non sampling errors would become a serious problem. Emphasis was placed on adequate field controls in data collection and on developing and implementing a reliable matching operation at the headquarters.

4. Universe covered in the PEC 1981

The universe covered was the poulation of Bangladesh residing in households at the time of the 1981 census enumeration. This definition excluded the following persons from the scope of the PEC.

- Institutional population covered in the census—persons living in military barracks, confined to hospitals, sanitariums, prisons etc.
- The floating or transient population covered in the census-persons that did not reside in a household but slept on the streets, at railway stations etc. This category also included people who were in transit on the 'census night', whether they were in hotels or travelling on trains, boats etc.

The PEC did, however, include persons who resided in 'messes' or 'group quarters' at the time of the census enumeration.

5. The 1981 PEC a three phase operation

The 1981 PEC was divided into three phases: The first phase was the PEC-A Field Survey.

The second phase was the Headquarters matching operation.

The third phase was PEC-B Field follow up operation.

PEC-A was an independent re-enumeration of 250 census enumeration areas (EA's), two and one-half weeks after the census. The purpose of PEC-A was to measure the number of persons missed in the census operation. The PEC-A sample of EA's was a one-stage, geographically stratified random sample selected systematically from the 187,000 EA's included in the census. The sample included 150 EA's from the rural areas of the country and 100EA's from the urban areas. For the purpose of the PEC, urban areas were defined as the 79 Pourashaves or Municipalities, the other urban areas—around 350 Rural Thana Headquarters—were included in the rural areas. The sample was self weighting and had a constant sampling fraction of 1/1128 in the rural areas and 1/167 in the urban areas.

Although population of the urban areas was only around 13% of the total population, the urban areas were oversampled to obtain separate coverage estimates for the urban population; from pretests it was observed that coverage estimates for the urban areas were subject to a much higher sampling error compared to coverage estimates for rural areas.

Emphasis was placed on making the PEC-A operationally as independent as possible from the main census. To ensure this the following measures were implemented :

- No information obtained in the census enumeration was supplied to PEC-A enumerators.
- The PEC-A enumerators were Bureau of Statistics employees specially recruited for the purpose.
- The location of the 250 EA's for the PEC was kept secret from all the census field staff.
- PEC-A field work did not begin until all census enumeration booklets had been removed from the Zonal Officers and put in storage in Dhaka.

The PEC sample had a two-way stratification design. The primary stratification was the grouping of the EA's by rural and urban areas and the secondary stratification was by geographical location within each primary strata. As a result of the secondary stratification, all seventy-one sub-divisions of the country had at least one EA included in the rural sample. Also, with this sampling scheme each area of the country was represented in proportion to its population size: for example 36 out of the 100 urban sample EA's fell into the Dhaka Statistical Metropolitan Area since Dhaka SMA represented about 36% of the defined urban population. In all, the sample covered 20,962 households (12,101 rural households and 8,861 urban households) and a population of 121,078 persons (71,205 rural and 49,873 urban).

For controlling the quality of field work, each PEC-A enumerator was supplied a map of his assigned EA. Also the field supervision was carried out by sixty-

four relatively high level headquarters personnel. Most of the PEC-A work was completed in a short period of time—week of 23rd of march 1981.

The purpose of the Headquarters matching operation was to classify each person listed in the census and PEC-A according to whether he/she was correctly enumerated in the census (a matched person) or tentatively missed in the census (a PEC person unmatched with the census). This required a person by person match between the PEC-A and the census of some 121,000 persons covered in the enumeration in the 250 EA's.

For this operation a set of matching rules was developed. These rules and a detailed description of the matching operation will be available in the detailed report on the PEC. Each EA was indepedently matched twice by a different matcher. Incorporating two independent matches did uncover significantly more legitimate matches than a single match procedure. By introducing this second independent match approximately 3% more matches were found as compared to a single-match procedure. PEC-B had two purposes to estimate the number of erroneously enumerated persons included in the census and to verify that persons classified as tentatively missed in the census (non-matches) actually were missed.

To estimate the number of "erroneously enumerated" persons the names of census enumerated persons from a special sample were sent to the field to determine from household members whether the person was correctly enumerated in the census or erroneously enumerated (i.e. duplicated, fictitious persons (etc.). This sample consisted of persons who were enumerated in the census in the PEC sample EA's but were not listed in the PEC re-enumeration—this had a relatively high probability of being erroneously enumerated.

For the tentatively missed person, verification was obtained as to whether the person was or was not present in the household on the census night. Because of confusion of reported names between the census and the PEC some persons were initially misclassified as missed when they actually could be matched.

6. The PEC estimation procedure

In arriving at national estimates, the rural and urban portions were first calculated separately and then combined to give the national estimates.

The basic equation utilized in the PEC estimation procedure was as follows:

$$R\ T = T_c - E_c$$

Where R = the completion rate of the census

T = the unknown 'true' total population figure

T_c = the total number of persons enumerated in the census

E_c = the total number of persons erroneously enumerated in the census.

The purpose of the PEC was to estimate T which is equal to

$(T_c - E_c)/R$. This required that PEC estimated R and E_c be applied to census total T_c to arrive at T

Estimation of R from PEC—Following the three phase PEC operation each person listed in the PEC sample was classified as either matched with the census or not matched with the census. After certain adjustments due to the moving—in and moving—out of persons between the time of census and PEC-A the estimate of R can be as follows:

R = m/t where m = the total number of matched persons in PEC and

t = the total number of persons in PEC i.e. matched plus non-matched.

Similarly E_c could be estimated as follows: From the PEC—B operation, the number of erroneously enumerated persons is obtained for the sample. Using the appropriate expansion, the sample total was blown-up to a national total which gave the estimated E_c.

Other estimates of interest were:

The missed rate = I—R

The erroneously enumerated rate = E_c/T

and the net error rate = the missed rate minus the erroneously enumerated rate = $(I-R)-E_c/T = 1-T_c/T$.

7. Major findings of the PEC-1981 : census coverage estimates and their standard errors

The principal coverage estimates for the 1981 Population Census of Bangladesh are summarized in Table-1. The completion rate for rural areas was 96.4% was significantly different from the 91.1% completion rate for urban areas. However, the 'erroneously enumerated' rates of 1.1% for rural and 1.2% for urban was not significantly different. Although the estimated completion rate for urban areas was subject to a higher standard error than for rural areas, both estimates had acceptable reliability in terms of sampling error.

To arrive at the adjusted population estimate, $T = (T - E)/R$ required substituting the appropriate coverage parameter estimates.

T (Rural) = (77,890,284—855,202)/0.964 = 79,911,911
T (Urban) = (9,161,740—122,379)/0911 = 9,922,460

This gave a population estimate for Bangladesh corrected for coverage errors of 89.834.371 as compared to the uncorrected census count of 87.052.024 i.e. the 1981 Population Census was subject to an estimated net error rate of—3.1%.

As to coverage errors, it was found that in the rural areas about 23% of the 'missed' persons were from households that were completely missed in the census while the remaining 77% of the 'missed' persons came from households that were enumerated in the census but household members were incompletely counted. In the urban areas 40% of the missed persons were

from completely missed households while the remaining 60% were from households enumerated in the census but with members incompletely counted.

For erroneously enumerated persons the results indicate that most of this error was due to counting persons in a particular household on census night when they were actually not present in the household. 73% of the erroneously enumerated persons were in this category in rural areas and 68% in urban areas. This type of error would include usual members who were either temporarily or permanently living away from the household either within the country or outside the country, persons who had died immediately before the census, etc.

The next most frequent type of error was the listing of fictitious or untraceable persons by the census enumerator. It was found that this type of error accounted for 23% of the cases in the rural areas and 30% of the cases in the urban areas.

The duplication of persons by a given census enumerator either within the same household or within the same EA had the smallest frequency among 'erroneously enumerated' persons. This amounted to 4% of the cases in the rural areas and 2% in the urban areas

8. Age-sex differentials of the 1981 Population Census Coverage Error

The principal coverage errors of the 1981 Population Census as estimated by the PEC and given in Table 1 were further disaggregated by age groups and sex separately for urban and rural components and are given in Table 1-A, Table 1-B and Table 1-C, showing the missed rates, erroneously enumerated rates and net error rates respectively.

Table 1-C presents net error rates in the Population Census enumeration which are obtained by subtracting erroneously enumerated rates from the missed rates. A wide urban-rural differential in the net error rate of the 1981 Population Census enumeration (7.7% versus 2.5%) is observed. This could be attributed to greater mobility of the urban population than the rural population.

The sex-differential in the net error rate is, however, not so marked in both urban and rural areas. Higher net error rate among males (8%) than among females (7.1%) in urban areas is consistent with higher mobility of males in urban areas. Higher net error rate among females (2.8%) than among males (2.3%) in rural areas is partly due to higher erroneously enumerated rate among males and partly due to marriage and widowhood of women. Mobility of women in Bangladesh generally increases at ages 15—19 because of marriage and also at older age of 50 and over because of widowhood: widows generally live with their several sons by rotation.

Age differentials are pronounced in both urban and rural areas and is more pronounced among males in rural areas. The net error rate is the highest (13.6%) among female children under one year of age in urban areas. Male children were similarly under-enumerated (11.5%) in age group under one year. Net error rate was higher among urban males in the age group (15—49) indicating mobility among the wage-earners of urban localities. This group of missed persons could be those who worked in urban areas but had left for their families living in rural areas during the census enumeration period. Erroneously enumerated persons who include persons counted in a particular household on 'Census Night' when they were actually not present in the 'household (about 70%), fictitiously enumerated persons (about 27%) and duplication of persons within the same household or within the same EA (about 3%) were largely among males and were higher in urban than in rural areas.

By age groups the erroneously enumerated rates among males were higher in working groups 20—54 in urban and 15—34 in rural areas. This seems consistent with the mobility of the working males. Among females the erroneously enumerated rates were higher in the early marriage age groups 10—19 in urban and 10—24 in rural areas which is the most mobile group among females.

9. PEC estimates of non-sampling errors in the Census—Response variance

The PEC also provided estimates of non-sampling errors or the levels of response variance for different items covered in the Population Census. Response variance for the purpose of estimating non-sampling errors of the Census was defined as the degree of agreement in reporting between the original census enumerator and the independent reinterview by the PEC enumerator for a matched set of persons/households. Low levels of agreement would indicate a high degree of response variability while high levels of agreement would indicate a low degree of response variability. Thus, the level of agreement between the recorded responses of the census enumerator and the PEC enumerator should give indications of the stability or quality of information for the selected items covered by the PEC. Results of the study given in Tables 2 to 9, indicate the levels of response variable for eight different items covered in the census. The level of agreement between PEC and census is the sum of the diagonal entries in each table.

As can be observed from the tables, four out of the eight items (sex, marital status, tenure of dwelling unit, literacy, roof material of household structure, highest grade passed, wall material of household structure, and age) showed enumerator agreement above 90% level, while the remaining four were in 60—90% range. The item which showed the least response variability was the reporting of sex (almost 100% agreement), while the item with the highest response variability was age reporting (63% agreement). It is interesting to note that as age increases the level of agreement steadily decreases—from a high of 89% for

age group 0—4 to an average of 36% for the five-year age groups above age 44 as the following figures show:

Response variance of age

Reported 5-year age groups	Levels of agreement
0—4	89%
5—9	75%
10—14	78%
15—19	62%
20—24	54%
25—29	53%
30—34	46%
35—39	44%
40—44	40%
45—49	38%
50—54	37%
55—59	32%
60—64	36%

For the reporting of 'highest grade passed', 'no school' showed a very high level of agreement of 94%, while the four other categories showed significantly lower levels of agreement:

Highest grade passed	Levels of agreement
No School	94%
1—9 years	71%
6—9 years	72%
SSC/HSC	77%
Graduate and above	74%

As the marginal totals for each enumerator tend to be very close for most of the eight items covered, most of the response variability are random in nature i.e., there is very little systematic bias associated with the reporting of either the group of census enumerators or the group of PEC enumerators. This absence of a systematic bias associated with the enumerators was an indicator that the census procedures, including training and supervision, were of acceptable quality. The only exception which may require further study, is the difference in marginal totals for the item literacy. The PEC enumerator tended to report more literates than the census enumerator (22% Vs 20%). Also, for another item, 'tenure of dwelling unit', the PEC enumerator tended to report more owned Du's and less rent free Du's as compared to the census enumerator.

10. Non-sampling errors in the measurement of coverage by the PEC

The sampling errors associated with the estimates of coverage appear to be well within acceptable limits (Table 1). However, these coverage estimates are also influenced significantly by various types of non-sampling errors. If these non-sampling errors are not well controlled they may constitute the major source of error. Generally they distort the estimates by either biasing them in a positive or negative direction.

Two potential sources of non-sampling error on which special emphasis for control was placed in the 1981 PEC relate to

the independence between PEC operation and the main census.

and the PEC/census matching operation.

The various PEC field procedures for maintaining a high degree of indepedence between the PEC and census have been mentioned. Combined with this was the special emphasis placed on PEC training and field supervision so that the data collected in the field would be of acceptable quality.

For developing a reliable matching procedure, the main criterion was to keep the two types of matching errors, erroneous matches and erroneous non-matches, as small as possible. The development of specific matching rules provided uniformity in matching and generally helped to reduced both types of matching errors. It was felt that for the Bangladesh situation, the rules that were applied had tolerance limits which were tight enough to keep the number of erroneous matches to a reasonable level. Other measures which were used were intended primarily to keep the level of erroneous non-matches at an acceptable level. These included independent matching, intensive search procedures, special attention to names in the PEC and use of PEC-B field follow-up to collect additional information on questionable non-matches.

The independent matching and PEC-B field follow-up had a positive effect on the estimated completion rate. The independent matching operations changed the estimate primarily by shifting some persons from an initial non-match status to a match status. The PEC-B field follow up changed the estimates primarily by shifting persons from the non-match category to the in-mover and out-of-scope categories.

11. Conclusions

On the basis of the analysis of the 1981 Population Census PEC methodologies and findings the following conclusions can be drawn tentatively:

The PEC successfully achieved its objectives. Through its findings the PEC succeeded not only in providing a direct, quantitative evaluation of the degree of coverage and quality of enumeration of the 1981 Population Census, but also an insight into the potential sources of undercoverage, omissions and errors in the census count, which would be of significant assistance in planning future population censuses in Bangladesh.

In the Bangladesh situation, because of complex socio-economic environment and early stage of the development of census technology, any large scale operation like the population census must incorporate a programme of direct evaluation of the operation.

The PEC provides a most cost-effective, readily adaptable and relatively simple means of direct evaluation of the census. If applied together with a few selected indirect methods, PEC could provide a comprehensive system of evaluation of large-scale field operations like the census in Bangladesh.

Like any other statistical field operation based on sampling, PEC is subject to both sampling and non-sampling errors and in it is the latter that constitute a major source of error and likely to distort the findings of PEC. While sampling errors can be minimized through selection of sample of optimum size and design, the non-sampling errors can be controlled only through manipulation of a variety of factors which need to be clearly identified before the PEC is undertaken and adequate steps taken well ahead of time for their control and management.

Two potential sources of non-sampling errors on which special emphasis needs to be placed in the PEC are independence between the PEC operation and the main census and PEC census matching. Training and field supervision of the PEC staff are the other critical elements that help in reducing non-sampling errors.

The three phase operation and timing of the 1981 PEC field survey ensured independence between census and the PEC. The census evaluation procedures, particularly the matching rules developed in the Popstan of the US Bureau of Census were found to be readily adaptable to the Bangladesh situation and contributed significantly to the ease of matching, leading to increase in overall efficiency of the PEC.

Judged by the degree of net coverage error (—3.1%) and response variance of the critical census-enumerated characteristics as estimated by the PEC, the 1981 Population Census of Bangladesh was a significant improvement over all past censuses both in terms of coverage and quality.

Incomplete count of household members is the most significant source of census undercount in Bangladesh, followed by complete missing of households. Complete missing of households is relatively more likely in urban areas, while in rural areas incomplete count of household members is more prevalent. Female children under one year of age is the single dominant group most likely to be under-counted in Bangladesh censuses. Duplication of persons or overcount is of minor occurrence. However, in a defacto census like the 1981 census, erroneous enumeration or enumeration of person not actually present in the household or enumeration of fictitious persons can pose certain minor problems. In all, enumeration in urban areas is likely to be relatively more error prone (resulting in greater degree of undercount) than in rural areas in census operations in Bangladesh, as has happened in the 1981 census.

Quality of enumeration as judged by the level of response variance varies with the characteristics enumerated in the census. The quality of enumeration with respect to personal characteristics like sex, marital status, literacy and highest grade passed, and housing characteristics like tenure of dwelling unit, roof or wall material household structure are likely to be significantly high in operations like the census in Bangladesh.

On the other hand, the quality of enumeration of age of both males and females turned out to be of significantly poor quality in the 1981 census. In fact, improvement of the quality of age enumeration will continue to be a critical problem for census takers in Bangladesh.

References

(1) Popstan—A case study for the 1980 censuses of Population and Housing, U.S. Bureau of the census 1979, parts A & B.

(2) A preliminary Report on Population Census 1981—Bangladesh Bureau of Statistics, Dhaka, June, 1981.

(3) 1981 Bangladesh Population Census—Report on the PEC (forthcoming) Bangladesh Bureau of Statistics, Dhaka.

Table 1—1981 Census Coverage Estimates and their Standard Errors (Rates in percentages)

Type of Estimate	Bangladesh Rate (Std. error)	Rural Rate (Std. error)	Urban Rate (Std. error)
Completion Rate	95.8 (0.22)	96.4 (0.2)	91.1 (1.0)
Missed Rate	4·2 (0.22)	3.6 (0·2)	8·9 (1.0)
Erroneously Enumerated Rate . .	1.1 (0.10)	1.1 (0.1)	1.2 (0.2)
Net Error Rate .	3.1 (0.24)	2.5 (0.2)	7.7 (1.0)

Table 1A—1981 Population Census Missed Rates by Age Group and Sex, Urban—Rural

Age Group	Urban		Rural	
	Males	Females	Males	Females
All Ages	**9.5**	**8.0**	**3.5**	**3.7**
Under 1	13.6	13.7	7.3	6.7
1—4	6.4	7.4	3.1	3.0
5—9	6.8	7.2	2.8	3.3
10—14	8.1	7.8	4.2	3.7
15—19	11.0	9.3	4.5	6.4
20—24	12.0	6.9	4.2	3.6
25—29	12.4	8.7	4.2	2.5
30—34	9.8	5.8	3.4	2.1
35—39	11.9	7.2	2.8	2.2
40—44	10.8	6.9	2.8	2.0
45—49	10.7	8.4	2.5	2.0
50—54	8.1	6.9	1.9	4.3
55—59	7.3	10.5	1.8	3.7
60—64	7.5	11.4	3.3	5.7
65 & above	8.0	12.2	2.4	8.1

Table 1B—1981 Population Census Erroneously Enumerated Rates by Age Group and Sex, Urban—Rural

Age Group	Urban		Rural	
	Males	Females	Males	Females
All Ages	**1.5**	**0.9**	**1.2**	**0.9**
Under 1	2.1	0.1	1.9	0.4
1—4	1.0	0.6	0.9	0.6
5—9	0.9	0.7	0.7	0.8
10—14	1.1	1.1	1.3	1.1
15—19	1.5	1.3	1.6	1.9
20—24	2.0	0.7	2.1	1.3
25—29	2.3	0.8	1.6	0.6
30—34	1.8	0.9	2.1	0.5
35—39	2.2	1.0	1.1	0.4
40—44	1.9	0.6	0.6	0.4
45—49	2.0	0.4	1.6	0.6
50—54	2.0	0.5	0.9	1.0
55—59	0.6	1.6	1.5	0.8
60—64	1.9	0.8	0.9	0.8
65 & above	1.3	1.9	1.1	1.3

Table 1C—1981 Population Census Net Error Rates by Age Groups and Sex, Urban—Rural

Age Group	Urban		Rural	
	Males	Females	Males	Females
All Ages	**8.0**	**7.1**	**2.3**	**2.8**
Under 1	11.5	13.6	5.4	6.3
1—4	5.4	6.8	2.2	2.4
5—9	5.9	6.5	2.1	2.5
10—14	7.0	6.7	2.9	2.6
15—19	9.5	8.0	2.9	4.5
20—24	10.0	6.2	2.1	2.3
25—29	10.1	7.9	2.6	1.9
30—34	8.0	4.9	1.3	1.6
35—39	9.7	6.2	1.7	1.8
40—44	8.9	6.3	2.2	1.6
45—49	8.7	8.0	0.9	1.4
50—54	6.1	6.4	1.0	3.3
55—59	6.7	8.9	0.3	2.9
60—64	5.6	10.6	2.4	4.9
65 & above	6.7	10.3	1.3	6.8

Table 2—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Persons[1]

Sex : 99.9% *Agreement*

As reported by the PEC enumerator	As reported by the Census Enumerator		
	Total %	Male	Female
Total %	100	51	49
Male	51	**51**	*
Female	49	*	**49**

*=less than 0.5%

1. Percentages based on a sample of 104,703 matched persons.

Table 3—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Persons[1]

Marital Status—97% *Agreement*

As reported by the PEC enumerator	As reported by the Census Enumerator				
	Total %	Never Married	Married	Widowed	Divorced
Total (%)	100	56	40	4	*
Never Married	56	**55**	1	*	*
Married	40	*	**39**	*	*
Widowed	4	*	*	**3**	*
Divorced	*	*	*	*	*

*=less than 0.5%

1. Percentages based on a sample of 104,703 matched persons.

Table 4—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Households[1]

Tenure of Dwelling Unit—95% *Agreement*

As Reported by the PEC enumerator	As reported by the Census Enumerator			
	Total (%)	Owned	Rented	Rent free
Total (%)	100	90	5	5
Owned	92	89	*	3
Rented	5	*	4	*
Rent Free	3	1	*	**2**

*=less than 0.5%

1. Percentages based on a sample of 17,891 matched households.

Table 5—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Persons[1]

Literacy—94% *Agreement*

As reported by the PEC enumerator	As reported by the Census Enumerator		
	Total (%)	Literate	Not Literate
Total (%)	100	20	80
Literate	22	**18**	**4**
Not Literate	78	2	**76**

1. Percentages based on a sample of 104,703 matched persons.

Table 6—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Households [1]

Roof Material of Household Structure—89% *Agreement*

As reported by the PEC enumerator	As reported by the Census Enumerator				
	Total (%)	Straw or Bamboo	Tally	SC.I. Sheet or Wood	Cement
Total %	100	58	3	37	2
Straw or Bamboo	58	**53**	1	4	*
Tally	2	*	**1**	*	*
C.I. Sheet or Wood	38	4	1	**33**	*
Cement	2	*	*	*	**2**

*=less than 0.5%

1. Percentages based on a sample of 17,891 matched households.

Table 7 Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Persons[1]

Highest Class Passed—88% Agreement

As reported by the PEC enumerator	As reported by the Census Enumerator					
	Total (%)	No Schooling	Class 1 to 5	Class 6 to 9	Secondary/ HSC	Degree
Total %	100	74	17	6	2	1
No Schooling	74	69	4	*	*	*
Class 1 to 5	17	4	12	1	*	*
Class 6 to 9	6	*	1	5	*	*
Secondary/ HSC	3	*	*	*	2	*
Degree	*	*	*	*	*	*

*=less than 0.5%

1. Percentages based on a sample of 104,703 matched persons.

Table 8—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Households[1]

Wall Material of Household Structure—85% Agreement

As reported by the PEC enumerator	As reported by the Census Enumerator				
	Total (%)	Straw or Bamboo	Mud or Unburnt Brick	C.I. Sheet or Wood	Cement or Brick
Total %	100	64	19	12	5
Straw or Bamboo	63	57	2	4	*
Mud or unburnt Brick	21	4	17	*	*
C.I. Sheet or Wood	11	3	*	7	*
Cement or Brick	5	*	*	*	4

*=less than 0.5%

1. Percentages based on a sample of 17,891 matched households.

Table 9—Comparison of Census Enumerator and PEC Enumerator Reporting for Matched Persons[1]

Age by Five-Year Age Groups—63% Agreement

As reported by the PEC enumerator	As reported by the Census Enumerator Ages													
Total (%)	0—4	5—9	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65+
Total (%)	100	17.4	17.1	12.7	9.0	7.4	7.4	5.8	5.3	4.3	3.4	3.0	1.8	2.2	3.2
Ages															
0—4	17.7	15.6	2.0	0.1	*	*	*			*	*				
5—9	16.5	1.6	12.6	2.2	0.1	*				*	*	*			
10—14	12.8	0.1	2.4	8.7	1.5	0.1	*	*	*	*	*		*	*	
15—19	9.1	*	0.1	1.6	5.6	1.5	0.3	*	*	*		*		*	*
20—24	7.5	*	*	0.1	1.5	4.0	1.5	0.3	0.1	*	*	*	*	*	*
25—29	7.6	*	*	*	0.3	1.5	4.0	1.3	0.4	0.1	*	*	*	*	*
30—34	5.6	*		*	*	0.2	1.2	2.6	1.1	0.3	0.1	*	*	*	*
35—39	5.1	*	*	*	*	0.1	0.3	1.1	2.3	0.9	0.3	0.1	*	*	*
40—44	4.3				*	*	0.1	0.3	1.0	1.7	0.7	0.3	0.1	0.1	*
45—49	3.4	*		*	*	*	*	0.1	0.3	0.7	1.3	0.6	0.2	0.1	0.1
50—54	3.0			*	*	*	*	0.1	0.1	0.4	0.5	1.1	0.4	0.3	0.1
55—59	1.9		*	*				*	*	0.1	0.2	0.4	0.6	0.4	0.2
60—64	2.2	*		*	*	*	*	*	*	0.1	0.2	0.3	0.3	0.8	0.5
65+	3.3	*	*	*	*	*		*	*	*	0.1	0.2	0.2	0.5	2.3

*=less than 0.1%

1. Percentages based on a sample of 104,703 matched persons.

BANGLADESH BUREAU OF STATISTICS
POPULATION CENSUS WING

PEC EA CODE [ ][ ][ ]

A. IDENTIFICATION

1 PEC HOUSEHOLD SL. NO.	2. CENSUS HOUSEHOLD SL. NO.	3. MALARIA HOUSEHOLD NO. (IF PRESENT)	4. ADDRESS OF HOUSEHOLD	5. NAME OF PRINCIPAL RESPONDENT	5.A CONTINUATION SHEET [ ]

B. GENERAL HOUSEHOLD INFORMATION

6. Wall Material

[ ] 1. Thatch/Bamboo Straw
[ ] 2. Mud Mud brick
[ ] 3. Tin/Wood
[ ] 4. Cement/Burnt Brick

7. Roof Material

[ ] 1. Thatch/Bamboo Straw
[ ] 2. Wood
[ ] 3. Tin
[ ] 4. Cement/Tile

8. Tenancy

[ ] 1. Owner
[ ] 2. Rented
[ ] 3. Rent free

C. LIST OF PERSONS STAYING IN HOUSEHOLD ON PEC NIGHT

Line No.	List the names of all persons who stayed in this household on PEC night, the night of Monday, the 23rd of March 1981. DO NOT LIST the names of the usual members of this household who were absent on the PEC night.		AGE (In completed years)	Relationship to Head 1. Head 2. Sponse 3. Children 4. Other Rel. 5. Non-Rel.	Sex 1. Male 2. Female	Marital Status 1. Never married 2. Married 3. Widowed 4. Divorced	Can Write a Letter ? 1. Yes 2. No	Highest Grade Completed 1. No School 2. 1-5 Class 3. 6-9 Class 4. SSC/HSC 5. Graduate and above	Was_____ present or absent from this household on PEC night, the night of Monday the 23rd of March ? 1. Present 2. Absent	Was_____ present or absent from this household on CENSUS night, the night of Thursday, the 5th of March ? 1. Present 2. Absent	Complete only if "2" has been entered in column 19 & age is "00" Ask was_____ born after CENSUS night ? 1. After CENSUS night 2. Before CENSUS night	Census Line No.
	GIVEN NAME	NICK NAME										
9	10	11	12	13	14	15	16	17	18	19	20	21
01												
02												
03												
04												
05												
06												
07												
08												
09												
10												

EXHIBIT-III
Confidential

PEC-B

MINISTRY OF PLANNING
STATISTICS DIVISION
BUREAU OF STATISTICS
1981 POPULATION CENSUS
POST ENUMERATION CHECK — — PEC-B

A. IDENTIFICATION

1. PEC Area : ☐☐☐ District : _____

City/Mouza : _____

2. PEC Household No. : ☐☐☐

3. Census Household No. : ☐☐☐

4. Address/Malaria Control No. : _____

B. INTRODUCTION OF SURVEY TO RESPONDENT

1. (To be read by enumerator) : The Population Census enumeration counted people where they stayed on the "Census Night", the night of Thursday the 5th of March. Shortly after the census there was another enumeration of households in your area. The purpose of the second count was to determine how well people were counted in the census. We have found some discrepancies between these two counts. I am here to ask some questions concerning these discrepancies.

2. Respondent's name : _____

3. Relationship to head : _____

Serial No.	Name	Age	Rel. to Head	Sex
C- 1				
C- 2				
C- 3				
C- 4				
C- 5				
C- 6				
C- 7				
C- 8				
C- 9				
C-10				

Continuation : ☐

another name in Section C or Section D T

(If "Yes" enter Serial No. of the other name (s) in Remarks

spend part of his/her time living away from this household because of attending school, working at a job or just staying in another household for any reason ?

(If "Yes" give details in Remarks)

night, the night of 5th March 1981, in this household or in another place ?

Section D. Non-matched Persons				
Serial No.	Name	Age	Rel. to Head	Sex
D- 1				
D- 2				
D- 3				
D- 4				
D- 5				
D- 6				
D- 7				
D- 8				
D- 9				
D-10				

Continuation: ☐

1		2		3		4
YES	NO	YES	NO	This household	Another place	
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		
☐		☐		☐		

PEC-B Enumerator's Name: _____

Date of Follow-up : _____

Supervisor's Name: _____

Date Checked: _____

SAMPLE REGISTRATION SYSTEM IN INDIA

P. PADMANABHA

Introduction

Reliable estimates of population and its components are a prerequisite for planning. The population census is the main source of information on the size of population, its growth rate and a host of other characteristics. However, the population census in India being decennial in operation, does not provide information on the change in the population from year to year and its components. The growth rate provided by the census relates to the decade as a whole. The measures of fertility and mortality derived from the census, which are the two major components of population change, are as at the mid-point of the decade. To provide continuous information the civil registration system should be the conventional source for data on vital events and should serve as the source of information on the changes in population from year to year and its components. However, the civil registration system in India is still deficient and, therefore, sample surveys serve as an alternate source to meet the ever-increasing need for reliable estimates of vital rates and other fertility and mortality indicators. The post independence era has therefore witnessed a number of demographic sample surveys which can be categorised as (i) local surveys (ii) regional surveys and (iii) all-India surveys. Among these surveys the Sample Registration System (SRS) has the unique feature of combining the advantages of the survey method and registration procedures. It is based on a dual record system. It consists of a continuous enumeration of vital events as they occur in a set of sample villages and urban blocks, supplemented by an independent six monthly survey to record the events that have taken place during the preceding six months in the same set of sample villages and urban blocks. The SRS can therefore, be regarded as a miniature registration system with the additional feature of six monthly retrospective surveys serving as checks for correcting and supplementing the information recorded. The SRS was initiated by the office of the Registrar General, India on a pilot basis in a few states in 1964-65. It now covers almost the whole country.

2. The main objective of the SRS is to provide reliable estimates of birth and death rates at the state and national levels. The SRS is based on the idea that with an adequate machinery for recording of births and deaths as they occur, together with a retrospective survey, it is possible to obtain reliable information on vital events which would yield reliable estimates of vital rates. The continuous enumeration of vital events is done by an enumerator and the independent six monthly survey by a separate investigator. The data obtained from these operations are matched. The unmatched and partially matched events are verified in the field to provide an unduplicated count of events. The advantage of this procedure, in addition to elimination of errors of duplication or omission, is that it can lead to a quantitative assessment of the sources of distortion in the two sets of records. It is, thus, a self-evaluating system.

Basic structure of the system

3. The main components of SRS are:

(i) Base-line survey of the sample unit to obtain usual resident population of the sample area;

(ii) Continuous (longitudinal) enumeration of vital events pertaining to usual resident population by the enumerator;

(iii) An independent half-yearly survey for recording births and deaths that have occurred during the half-year under reference and up-dating the houselist and household schedule by the investigator;

(iv) Matching of events recorded during continuous enumeration and those listed in the half-yearly survey;

(v) Field verification of unmatched and partially matched events.

Baseline survey

4. The base-line survey is carried out prior to the start of continuous enumeration. This involves house numbering and houselisting and filling-in of the household schedule. Wherever a sound system of house numbering exists, it is adoped. Otherwise, the house numbering is done by the enumerator with the number being indicated at a conspicuous place near the entrance to the house. The enumerator prepares a notional map showing important landmarks and location of the houses covered by the sample unit. He then prepares a list of houses and households and completes the household schedule, wherein he records the residential status and demographic particulars of each individual residing in the household such as the name, sex, age, marital status and relationship to head of household. Visitors to the household on the specified date who are likely to stay in the household for a fairly long period are also listed and their residential status is shown as 'V' as against "UR" for usual residents. Those living in public institutions like hotels, schools and hospitals are excluded, but households living permanently within the compound of such institutions are covered.

Enumeration

5. The enumerator maintains a birth record and a death record for his areas. He is expected to record all births and deaths occurring within the sample unit, as well as those relating to the usual residents occurring outside the unit. Events to visitors occurring within

the sample unit are also listed, but these are not taken into account while calculating rates. Thus, the events to be enumerated by the enumerator are those pertaining to

(i) Usual residents inside the sample unit

(ii) Usual residents outside the sample unit.

(iii) Visitors inside the sample unit.

6. For ensuring complete netting, the enumerator adopts various measures to gather information on the occurrence of vital events in the sample unit. The enumerator takes the help of the village priest, barber or headman, the midwife and similar functionaries. He contacts these informants at frequent intervals and collects information about the occurrence of events. The enumerator visits the concerned household and records the prescribed particulars. The enumerator also keeps in touch with other socially important persons and visits local or nearby hospitals, nursing homes, cremation or burial grounds at frequent intervals to keep himself informed about the occurrence of events. He is required to maintain a list of pregnant women as an aid to netting all the birth events. Despite all these efforts, the enumerator may fail to have information about some of the events. So he is required to visit all the households once a quarter and ensure that all the events have been recorded. In the urban areas, the enumerator is required to visit each household once a month.

Half yearly survey

7. The half yearly survey is carried out independently in each sample unit by a full-time investigator. The investigator visits the households in the sample unit and records the particulars of births and deaths pertaining to usual residents and only those occurring within the sample unit relating to visitors which have occurred during the half-year under reference. Simultaneously, he updates the houselist and household schedule by making suitable entries for each birth, death or for migration. In carrying out this survey he does not have access to the birth and death records of the enumerator, which are withdrawn from the field before the investigator is deputed for the half-yearly survey. Also, an overlapping reference period of one year is adopted in the survey in order to net the events which might have been missed in the previous half-yearly survey.

Matching

8. After the completion of the half-yearly survey, the birth and death record forms filled-in by the investigators are compared with the corresponding forms filled-in by the enumerators. This is done either at the state or district headquarters. Each entry in the enumerator's and investigator's records is matched item by item and events are classified as fully matched, partially matched or unmatched. The items generally considered for matching are location of the household, i.e., name of the head of household and house-number, name of mother (for birth) and name of the deceased (in case of death), residential status, sex and month of occurrence.

Field verification of unmatched and partially matched events

9. Every event which is either unmatched or partially matched is verified by a visit to the concerned household. This is done either by a third person or jointly by the investigator and the enumerator, depending upon the availability of staff.

Sample design

10. A uni-stage stratified simple random sample has been adopted in the rural areas. Each state was first stratified on the basis of natural divisions which were further sub-stratified by size-classes of population. Inhabited villages were classified by four population size classes:

(a) less than 500

(b) 500—999

(c) 1000—1999

(d) 2000 and over

Villages with population of 2000 and over were broken into segments having approximately equal population and not exceeding 200 each. The sample units were allocated to the different strata in the proportion of stratum population. The sample unit is a village or a segment of a village if it had a population of 2000 and over in 1961.

11. In the urban areas a two-stage stratified simple random sample was adopted, with towns/cities as primary sampling units and census blocks as second stage units. The population of a census block in urban areas ranged between 750 and 1000. Towns and cities within a State were first stratified according to the 1961 Census population as:

Stratum	I	—	towns with population 100,000 and above
Stratum	II	—	towns with population 50,000–99,999
Stratum	III	—	towns with population 20,000–49,999
Stratum	IV	—	towns with population less than 20,000.

12. Sample units were allocated over the four strata in proportion to their population. All cities in stratum I were included. The other towns and the blocks were selected on a simple random sample basis. In allocating the number of sample blocks to these cities/towns, it was ensured that each area had at least two blocks.

13. The sample size for rural areas was determined by using a binomial model by assuming the value of the parameter as 0.04 (or a birth rate of 40 per 1000) and a given coefficient of variation of one per cent. The number of sample units in the rural areas was 150 in each of the major states. In the urban areas the sample size varied from 60 to 100 census blocks.

4. The SRS operates in 3,700 sample units select- from the 1961 census frame of which the number units in the rural areas is 2400. It covers a popu- on of 4.2 million representing about 0.7 per cent he rural population and one per cent of the urban ulation. Recently, another 1700 sample units have n added from the 1971 census frame to the exist- sample units with a view to increasing the preci- n of the estimate of which 1252 are in the rural as. Thus the total population covered is over 5.7 lion.

ganisation

5. The office of the Registrar General, India is res- nsible for overall co-ordination and implementation the system. The SRS at the state level is under the ntrol of either the Directorate of Census Operations the Bureau of Economics & Statistics or the Health rectorate. There is an enumerator for each sample t, who is usually a resident teacher employed on a rt-time basis and paid a small honorarium. In tain states, full time enumerators have also been pointed in the large cities. One full time enumerator usually assigned 6 to 8 sample units. For supervision d conduct of half-yearly surveys, there are full-time estigators at the state headquarters. One investiga- is usually assigned a set of 10 sample units for pervision work and another set of 10 units for con- cting the half-yearly surveys. In addition to the enu- rators and investigators, a nucleus staff is provided the state level for overall direction and administra- n of the scheme.

16. Periodic training workshops for the supervisory ff and enumerators are conducted. These workshops ver aspects such as concepts and definitions, duties d functions of the basic field workers, type of events. ely to be missed and type of checks to be exercised the field staff etc. To ensure uniform concepts and nigh standard of work, four manuals have been pre- ibed separately for enumerators, supervisors, head- arters staff and for the matching operation.

17. Each investigator has been assigned 10 sample its. He is required to carry out regular inspection of work of the enumerator who does the continuous umeration. Higher level personnel such as Tabula- n Officers or Assistant Directors or the State Super- ory Officers also supervise the work of the enumera- s and investigators. Corrective steps are taken in ose units where the work is found to be unsatisfactory. e investigators and the supervisory officers are re- ired to submit an inspection report in a prescribed mat. The performance of the enumerators and estigators are evaluated on the basis of the inspec- n report and corrective steps taken.

ms of information collected

18. In addition to population by age, sex and marital tus as collected in the household schedule, the lowing details of each birth and death are also orded.

rths

(i) Place of Birth

(ii) Date of Birth

(iii) Live birth or still birth

(iv) Single/Multiple birth

(v) Sex

(vi) Particulars of the mother

(a) Residential status (URP/URA/V)

(b) Age

(c) Religion

(vii) Type of attention at time of delivery

Deaths

(i) Place of death

(ii) Date of death

(iii) Particulars of deceased

(a) Name

(b) Relation to head of household

(c) Residential status (URP/URA/V)

(d) Sex

(e) Age at death

(f) Marital status

(g) Religion

(h) Medical attention before death.

Estimation procedure

19. The estimates of total population, births, deaths at the state level in the rural areas are obtained by ratio method using the 1961 census population as a supplementary variable. The estimates of birth and death rates are obtained as the ratio of estimated births to estimated population and estimated deaths to estimated population respectively. In the case of urban areas the estimates of total population, births and deaths at the state level are obtained using unbiased method at both stages. Estimates of birth and death rates are then obtained as in the case of rural areas.

20. The final birth and death forms are scrutinised at the state headquarters, for which purpose a detailed scrutiny programme is specified. These forms, after scrutiny, are sent to the office of the Registrar Genral, India for further processing. A minimum tabulation programme has also been prescribed for the preparation of state reports. The information recorded in the birth & death forms received from the state headquarters is transferred to punch cards. A set of tables pertaining to fertility and mortality is generated through the computer. Detailed analysis of the results is brought out in the form of reports.

21. Apart from these reports, a SRS Bulletin is regularly brought out at half-yearly intervals giving estimates of birth and death rates at the state and national levels separately for rural & urban areas. The compilation for these estimates is done manually.

Measures for improving the efficiency of SRS

22. The SRS has several built-in checks to ensure completeness in reporting. The population recorded in the baseline survey is updated in subsequent half-yearly surveys. Before the baseline survey is carried out, the sample units are clearly demarcated by well-defined boundaries, notional maps are prepared and all the houses in the sample units are numbered wihch ensure complete listing of the households and the population residing in the sample units. Since the population recorded in the subsequent half-yearly surveys would be the result of population recorded in the previous survey plus the net addition resulting from births and deaths and also in-migration and outmigration, a simple arithmetical check is available for ensuring the correctness of the population recorded in each half-yearly survey. As regards the continuous enumeration of vital events, the enumerator is required to prepare a list of informants for frequent contacts for getting the information on births and deaths. He is required to maintain a list of pregnant women, have frequent contacts with socially important persons in the unit and carry out quarterly field rounds which could help to ensure completeness in reporting of all events.

23. The half-yearly surveys provide a check on the events recorded by the enumerators. Further, adoption of an overlapping reference period of one year in each half-yearly survey helps in the detection of events that might have been missed in the earlier survey. For maximising the efficiency of the two operations, independence between continuous enumeration and half-yearly surveys is ensured by withdrawing the enumeration records from the sample units before the conduct of the half-yearly survey. Also, each investigator is assigned one set of sample unit for conducting the half-yearly survey, and another set of units for carrying out supervision work which leaves little scope for collusion between the investigator and the enumerator.

24. However, inspite of such built-in checks, both the enumerators and investigators sometimes fail to net a few events. Studies have revealed that the type of events missed by enumerators are usually those which have occurred to usual residents outside the sample unit. This happens because expectant mothers often go to their parents' house for delivery or members of a household move to a place outside the unit for hospital facilities. Another type of event which is missed is perinatal death (foetal death and death of a new born within 7 days). Events are also likely to be missed by both the enumerator and investigator in the case of single member households. Continuous monitoring of the performance in individual sample units, ensuring proper training of the field staff and intensifying supervision help minimise such omissions. Several steps have been taken for improvement in the quality of data and these are:

(a) review of trends in the total events netted—A comparison of the total number of events netted over the past five years, unit-wise, and separately for each half-yearly survey, is often helpful in locating units where the work is not quite satisfactory. Sample units which show large variations in the number of events netted are identified and the implementing agencies are called upon to take corrective steps, including a review of the work of the field staff.

(b) review of the performance of investigators and enumerators—An assessment of the efficiency of the enumerators and investigators is made by classifying events unit-wise on the basis of common events, events listed by the enumerator but missed by the investigator, events listed by the investigator but missed by the enumerator and events not listed by both. A comparison of the total number of events in each of these categories over a number of years will provide an idea of the efficiency of the enumerators and investigators. Corrective steps can be taken wherever the work is not satisfactory.

(c) use of control limits—A watch on the quarterly figures of births and deaths is maintained by the state headquarters unit-wise. Inspections are carried out of units where the figures recorded by the enumerators differ from control limits by a margin of 20 per cent. The control limits are determined for each state on the basis of a three year moving average at the stratum level separately for each half-year.

(d) by intensive enquiry—In view of the importance of the SRS as the only source of reliable information on vital events, an intensive enquiry has been conducted in the larger states through a special questionnaire. This enquiry has been conducted by senior levels in a 10 per cent sub-sample of the SRS units. The intention of such an enquiry is to obtain a correction factor for vital rates and also to identify types of missed events.

25. Apart from these administrative measures, the replacement of the sample units has also been considered necessary. The original sample size of the SRS was 3700 units selected on the basis of the 1961 census frame. A sample of 1700 units was added in 1976-77 which was selected from the 1971 census frame. Some of these sample units, specially those which had a population of just over 1500 in 1961, have now crossed the limit of 2000, with the result that such units have become rather large for a single enumerator. Also, over a period of time some villages have been classified as urban units and in a few cases urban units have been declassified as rural units. Such changes necessitate a constant monitoring of the SRS sample itself. Because of such changes, retention of the same sample indefinitely may lead to loss of its representative character. Also, because of the increased work load, large units would have to be segmented into manageable size or additional enumerators would have to be appointed. The appointment of new enumerators is not always possible because of lack of staff at the field level. Moreover, the retention of the same sample over the years introduces

ditioning effect" as a result of which the enumera-
ends to lose interest in the work and the households
selves tend to give routine responses not always
sufficient clarity. Experience indicates that, over
ng period, the enumerator develops a set of sources
nformation on whom he comes to depend totally
void field work. Also, the households themselves
to regard the continuous enquiry as an unneces-
imposition on their goodwill. In these circums-
es, the results would tend to be unreliable selection
resh sample units from the 1981 census frame for
nediate replacement of the existing sample units
olves establishment of the sample registration in
new units which will take considerable time and
rt by way of proper identification of sample area,
selisting, conduct of baseline survey, selection and
ning of field supervisory staff. Thus, if all the
s are replaced on the basis of the 1981 census
ne, continuity may be lost as the system takes
e to stabilise itself before reliable estimates of
l rates become available. Therefore, the replace-
nt of units on the basis of the 1981 census frame
eing done in stages as follows:

(i) All the SRS urban blocks based on the 1961 census frame have been replaced from 1-1-1982.

(ii) All the rural sample units on the 1961 census frame pertaining to the North-Eastern States and Union Territories (except Assam) have been replaced from 1-1-1982.

(iii) In the case of Himachal Pradesh, Bihar and West Bengal the entire 1961 rural sample units have been replaced from 1-1-1982.

(iv) 50 per cent of the 1961 rural sample units in the states of Andhra Pradesh, Gujarat, Jammu & Kashmir, Kerala, Maharashtra and Tamil Nadu have been replaced from 1-1-1982.

(v) The remaining sample units based on the 1961 census frame will be replaced from 1-1-1983.

(vi) The sample units on the 1971 census frame will be replaced from 1-1-1984.

e use of the SRS for research and special studies

26. The SRS has great potentialities for a variety demographic studies that can be undertaken within framework of the system and also serves as a ting ground for methodological studies. The data lected provide estimates of various fertility and mor-ty indicators at state and national levels. Also, the cial surveys conducted under SRS provide varied l detailed data on various socio-economic groups. rtility and mortality indicators for which estimates available over the years at state and national els and for rural and urban areas include crude h rate, crude death rate, age specific fertility rate, eral fertility rate, total fertility rate, gross repro-tion rate, age & sex specific death rate and infant rtality rate by age & sex. Such data enable a dy of the trend and pattern of fertility and mortality l also a study of the fertility and mortality differen-s among states and between rural and urban areas. e age-wise mortality data also enable construction ife tables. Further, the information collected on the type of medical attention at birth or before death serves as an indicator of the extent of medical help available at state and national levels and in rural and urban areas.

27. A number of special surveys have been carried out from time to time in SRS units along with the regular half-yearly surveys. They are:

(i) Survey on the extent of knowledge and practice of family planning methods in a sub-sample of SRS units during 1971-72.

(ii) A fertility survey during 1972 in a sub-sample of SRS households in each unit with a view to studying the fertility differentials by socio-economic groups.

(iii) Survey on the extent of practice of family planning methods in 1979.

(iv) Survey on infant and child mortality in 1979 to provide estimates of infant and child mortality and to study the pattern and differentials of fertility and mortality by socio-economic groups, health and child care of infants and children.

28. The SRS is also useful for evaluating data from other sources. For example, the SRS birth records were used to determine the extent of under-enumeration of children in the age group 0—4 years in the 1971 census. A similar study is envisaged for the 1981 census. The records of vital events in the SRS blocks are available for a period of 10 years and it is, therefore, possible to compare the births recorded in the SRS records with corresponding information with regard to children surviving as on the date of the census. Such a comparison of records permits the estimation of the extent of omission or duplication at younger ages and an estimation of the extent of age mis-reporting at younger ages in the census. The main objective of the census evaluation study based on a comparison of the SRS records is to obtain an idea of the extent of omission or duplication of children below 5 years as recorded in the census and the accuracy of their age returns. In connection with the 1981 census, such a census evaluation study has been carried out with respect to 50 SRS units in the rural areas and 25 SRS units in the urban areas in each State. Altogether, for the purposes of this study 2,200 SRS units were taken into consideration.

Conclusion

29. The civil registration system being deficient and a one time retrospective surveys not being capable of yielding reliable estimates of vital rates, the SRS has been recognised as the main source for providing dependable demographic measures. The distinguishing feature of the SRS is that the longitudinal registration system establishes continuity of the recording of vital events by local resident enumerators and thus minimises the recall bias while the independent half-yearly surveys ensure full coverage and netting of vital events. Continuous efforts are being made to improve the system by intensive supervision, periodic inspection and evaluation. Replacement of old units by new units selected on the basis of the 1981 census frame is also a step in this direction.

ON STRENGTHENING OF DEMOGRAPHIC DATA BASE IN INDIA

K. C. Seal and Suguna Kumari

1. Introduction

1.1 Collection of demographic data on various aspects in respect of our country has expanded rapidly especially over the last two decades with the introduction of the Sample Registration Scheme (SRS). Side by side with this expansion, it is necessary to build up adequate data base that could serve the needs of planners and policy makers. In this paper an attempt has been made to scrutinise the quality of the data particularly in respect of internal migration data and check the consistency among data available from different sources. Some suggestions have been made for strengthening the data base both in terms of quality and coverage.

1.2 The population census had for long been the only source of reliable demographic data in the past especially for small areas. Estimates of average birth and death rates and survival rates over 10-year periods are generally derived by comparison of the population by age and sex of two consecutive censuses.

Though the Civil Registration System existed in most areas of the country, the data have been both quantitatively and qualitatively deficient and therefore unreliable. With the advent of the National Sample Surveys in the 1950's, more detailed demographic data, though only for fairly large areas, such as estimates of birth and death rates at shorter intervals became available. After the introduction of the Sample Registration System (SRS) in 1966 it became possible to obtain annual series of birth and death rates, age-specific fertility and mortality rates and infant mortality rates.

2. Quality of SRS data on vital rates and natural growth rates

2.1 The SRS not only provides current annual series of data on fertility and mortality at State level, but is capable also of reflecting the true changes and trends over time. However for reasons explained below some doubts about the quality of SRS data have been expressed in recent months. This has led the Registrar General of India to institute a special intensive check of the SRS data in most of the major States in 1981. However, results of this study are not yet available. Other evaluation studies of SRS data have been sporadic.

2.2 But these investigations have been carried out mostly in small sub-samples of the SRS sample and consequently the results cannot be considered to bring out the extent of under-estimation for the whole country.

2.3 The 1981 census provisional population has revealed an annual growth rate of 2.23 per cent for the decade 1971-81 as against the average rate of natural increase of 1.98% (including the provisional estimate for 1980) estimated from SRS, leaving a wide margin between the census and SRS growth rates. In the absence of any significant external migration for the country as a whole, the rate of natural increase can be taken to be virtually the same as the growth rate. This has led to a great deal of confusion and speculation as to the actual levels of birth and death rates for the decade. Several demographers and research scholars have probed into the reasons for this anomaly. Some of the reasons ascribed for this difference are better coverage of population count in the 1981 census as compared to 1971 census, significant external migration into the country and a high degree of underestimation in the SRS rates resulting in under-estimation of growth rate. The post enumeration check of the 1981 census has revealed an under-count of 17.95 per thousand which is quite close to that of 1971 census. As such the growth rate of 2.23 per cent does not seem to be exaggerated on account of better coverage in 1981 census. Whether external migration into India has been significant during 1971—80 can be known only when the tabulations of migration data become available.

2.4 The reliability of SRS data has been examined in all these studies with reference to data from other sources and the most likely average levels of birth and death rates for the decade have been arrived at. The average rates for 1971—80 arrived at in some of these investigations and the SRS rates are given below:—

Study by	Birth rate	Death rate
S.R.S.	34.5	14.7
K. Srinivasan	36.5	14.7
S. Mukerji	36.6	16.1
P. Visaria & L. Visaria	35—39	16.0 to 16.9
T. Dyson	*	*

*2-3 points decline in birth rate for the decade which comes to around 38 and a slight decline in death rate.

It can be seen that these estimates span a wide range of levels implying varying degrees of under-estimation in SRS rates, from which consensus seems to emerge. Though some of these estimates are quite close to the SRS rates for the country as a whole, the detailed investigation made in some of these studies reveals that at least for a number of States the SRS rates are under-estimates. However, in the absence of proper measures of under-estimation in SRS rates, it is not possible to reconcile the SRS and census growth rates. Only when the intercensal birth and death rates are scientifically computed from the detailed census data on age and sex, a reasonably good idea of the extent of under-estimation in SRS rates for the decade is expected to be known.

6—5 RGI/ND/84

2.5 The SRS annual rate series have shown a sharp decline in vital rates during the decade. It is, however, suspected that the entire decline is not real and it is due, at least partly, to progressive deterioration in the coverage of vital events. Considering that the vital events in a fixed sample are being collected over several years by the same local enumerators, there is every likelihood of deterioration in coverage, unless intensive supervision is kept up. Special investigation about the quality of SRS data is, therefore, called for from time to time, so that spurious changes in the vital rates estimated from SRS over time, can be detected.

2.6 No doubt, evaluation of vital data is built into the SRS itself. But this is based on the assumption of independent enumeration and subsequent matching of vital events in the dual operations viz., continuous enumeration and half-yearly survey. The difficulties in keeping the two operations independent in the field conditions are quite well-known. Therefore, while efforts have to continue to be made to keep them as completely independent as possible, there is need for some other independent evaluation of the SRS data at regular intervals. It would be desirable to have a special team of investigators for this evaluation so that the assessment of data could be made independently of the SRS field work. The special team could be entrusted with the task of carrying out the evaluation study in all the States by rotation.

2.7 The evaluation of SRS data may be carried out through a survey of households in a sub-sample of the SRS units at least once in 3 to 4 years. The vital events pertaining to members of households in the last 6 months to one year have to be collected through intensive probing by the special team of investigators who are not in any way involved in SRS field operations. The members of the team have to be specially trained for the necessary probing for collection of retrospective data on vital events. The evaluation survey will have to be carried out in these states on a priority basis where there is reason to suspect that the vital rates are under-estimated or there are unusual fluctuations in the annual rates. As the SRS has just switched over to a fresh sample, it would take some time for the field work to stabilise. Hence the evaluation can start say, around 1985 when the estimates of vital rates for 1983 become available.

2.8 Besides independent evaluation of SRS data by a special team of trained investigators, vital rates available from other sources should also be utilised as external checks, wherever feasible to assess the reliability of SRS rates. For this purpose, data from large scale demographic surveys carried out by NSS or other independent agencies from time to time could be used. According to current plans the NSSO will be conducting demographic surveys once in 10 years. In these surveys detailed data on fertility, mortality, migration etc. are expected to be collected. The NSSO in its 39th round is at present trying some methodological changes to improve the quality of its demographic survey data. Once this is achieved the comparative analysis of SRS and NSS data is expected to throw light on possible deficiencies in the data collected from both the sources.

3. Quality of migration data

3.1 Next to the vital rates, data on internal migration are important as a component of regional population growth. The level of inter-State migration is quite significant, at least for some States. In fact with district level planning assuming importance, there is growing demand for migration data at district level.

3.2 Migration data are available from the population census and from the National Sample Surveys. The earlier population censuses, give migration data only from the place of birth statistics. This provides life-time migration which has no fixed time frame of reference. From 1971 census onwards information on place of last residence and duration of residence have been collected. The tabulation of migrants with duration of residence less than one year gives migration during the last year.

3.3 The concepts of internal migration adopted in NSSO surveys are somewhat different. In the early rounds of NSS persons whose place of residence was different from their native place were treated as migrants. In the 14th and 15th Rounds (1958-59 and 1959-60) different concepts of migrants were experimented with and from the 18th Round (1963-64) onwards a person whose place of residence one year ago was different from the place of present residence is treated as a migrant.

3.4 Since migration data are available from the NSSO 28th Round, October, 73—July, 74 which is not very far from 1971, an attempt has been made to test the consistency of the NSS and 1971 census results in regard to internal migration.

3.5 For migration of 1971 with duration of residence less than one year the place of last residence would be the place of residence one year ago, provided they had not moved more than once during the last year. Thus the migrants of the 28th round of NSS Survey and those of 1971 census with duration of residence less than one year would be the same conceptually, except for those who had moved more than once during the last year. Since the probability of more than one move during a year would be quite small, we may expect that the migrants of the NSS 28th Round and migrants of 1971 census with duration of residence less than one year would be virtually identical. Even among those who have made more than one move during the last year only those whose place of residence one year ago is the same as place of present residence would not be migrants in the NSSO surveys, whereas, they would be reckoned as migrants in census. All others would be reckoned as migrants in the NSSO survey also, though the place of origin may be different according to 1971 census and NSSO survey concepts. Thus the migration rates derived of the 1971 census data in respect of migrants with less than one year duration and those to be obtained from the NSSO 28th Round survey should be broadly

comparable in spite of the different definitions adopted in census and NSS under the plausible assumptions that persons moving more than once during a year would be relatively small and that the pattern and intensity of migration would not have changed significantly between March 1970—Feb. 71 and Oct. 1972—July 74 that is the years preceding the census and the NSSO survey respectively. Thus the annual migration rates derived from the two independent sources can be reasonably expected to be of the same order.

3.6 The table given below compares the State-wise in-migration rates from 1971 census and NSSO 28th Round. In-migration rates have been computed in the NSSO with the population of the receiving State as base. Similar rates have been computed from the census.

Comparison of Annual In-migration rates per 10,000 population of 1971 Census & NSS 28th Round—State-wise

State	Rural		Urban	
	1971 Census	NSS 28th Round	1971 Census	NSS 28th Round
1	2	3	4	5
Andhra Pradesh	265	147	368	222
Assam	171	29	406	82
Bihar	116	26	191	85
Gujarat	249	25	279	57
Haryana	300	113	361	290
Himachal Pradesh	522	87	1093	306
Jammu & Kashmir	199	133	302	100
Kerala	133	190	224	373
Madhya Pradesh	327	57	344	150
Maharashtra	277	144	262	221
Mysore	244	116	308	184
Orissa	218	122	538	402
Punjab	223	109	415	183
Rajasthan	242	91	361	221
Tamil Nadu	133	153	246	276
Uttar Pradesh	177	50	225	143
West Bengal	29	91	85	185
All-India	200	91	274	194

3.7 The table reveals that the census and NSS rates differ widely both for rural and urban areas, the census rates being generally higher than the NSS rates. For several States, the census rates are in fact much higher. In Kerala, Tamil Nadu and West Bengal, however, in both rural and urban areas the NSS rates are higher, the more so in Kerala and West Bengal. Both the census and NSS rates generally show the expected rural/urban pattern with higher in-migration rates for urban areas than for rural areas. The only exception is Maharashtra in regard to their census rates. The states with highest census rates do not necessarily have the highest NSS rates.

3.8 The reasons for these wide differences between census and NSS rates could be manifold. Firstly, the difference in concept and definition of migrants adopted by NSS and census arising from different treatment of persons who have moved more than once in the last year may be sizeable and even large, adding considerably to the census migration. Such frequent movements would more likely comprise return migration as in the case of persons migrating for seasonal employment, students migrating for education etc. In the census conducted during the specific month of February, students would mostly be enumerated at the place of education and therefore be counted as migrants. This is not likely to be case in the NSSO survey where majority of students are more likely to be stationed at the place of enumeration one year ago, whether it is the place of education or at their homes on vacation. Similar would be the case of persons migrating seasonally for employment. Secondly, the rate of migration might have actually declined during the period between the years preceding the 1971 census and the NSSO 28th Round Survey. A decline in almost all the States, as observed, could possibly occur due to increased agricultural activity in rural areas in a good agricultural year or worse employment situation and poorer living conditions in urban areas or a combination of both in the year preceding in the NSSO Survey. The available data on Gross Domestic Product (GDP) for these years, do not however, indicate such changes. Thirdly, there could be some difference in the interpretation of the place of usual residence, both of present as well as of last residence by the two field agencies.

3.9 Of the total in-migration for any State, inter-State migration would be the major component, as migration over short distances within a State are more frequent. However, from the point of view of the growth of population of States, inter-State migration is important. While this factor may be small and insignificant for some States, at least for some other States it may be large enough to influence population growth. For projections of population of such States, firm annual rates of inter-State migration are required. It will be fruitful to examine how this important component of migration compares between the Census and NSS.

3.10 In the census, though data are presented only for in-migration, out-migration could be derived from the place of origin. However, the classification of place of origin into rural and urban is not complete and a significant part of the migration is shown as unclassifiable. Though such unclassifiable migration is not so large for duration less than one year, as compared to longer duration, it is still significant. For the purpose of our study, this unclassifiable category of migrants has been apportioned between rural and urban areas proportionally. In general, the error arising out of wrong allocation to rural/urban by adopting this method of apportionment seems unlikely to affect the rural and urban out-migration. Out-migration rates have been computed with the population of the State of origin as base, as in the case of NSS rates. The table below gives a comparative picture of the State-wise inter-State in-migration, out-migration and net-migration rates of 1971 census and NSS 28th Round.

3.11 Taking the in-migration rates first, it can be seen that as in the case of total in-migration the

Inter-state In-Migration, Out-Migration and Net-Migration Rates per 10,000 Population from 1971 Census and NSS 28th Round Survey

State	IN-MIGRATION				OUT-MIGRATION				NET-MIGRATION			
	Rural		Urban		Rural		Urban		Rural		Urban	
	1971 Census	28th Round	1971 Census	28th Round	1971 Census	28th Round	1971 Census	28th Round	1971 Census	28th Round	1971 Census	28th Round
1	2	3	4	5	6	7	8	9	10	11	12	13
Andhra Pradesh	14	13	54	23	15	6	48	19	(—) 1	7	6	4
Assam	26	3	118	49	13	5	108	74	13	(—)2	10	(—)25
Bihar	10	1	44	9	16	10	92	26	(—)6	(—)9	(—)48	(—)17
Gujarat	27	3	69	12	14	4	38	30	13	(—)1	31	(—)18
Haryana	103	41	187	143	59	31	198	58	44	10	(—)11	85
Himachal Pradesh	73	23	409	112	72	16	408	200	1	7	1	(—)88
Jammu & Kashmir	30	19	75	23	30	6	161	103	..	13	(—)86	(—)80
Karnataka	36	9	71	21	22	13	55	54	14	(—)4	16	(—)33
Kerala	14	25	39	81	13	7	135	50	1	18	(—)96	31
Madhya Pradesh	36	2	107	31	23	9	65	44	13	(—)7	51	(—)13
Maharashtra	24	7	82	28	29	12	50	41	(—)5	(—)5	32	(—)13
Orissa	17	9	104	46	12	4	75	33	5	5	29	13
Punjab	45	15	158	72	47	15	175	56	(—)2	..	(—)17	16
Rajasthan	35	23	95	36	50	9	109	12	(—)15	14	(—)14	24
Tamil Nadu	6	9	33	31	20	12	36	11	(—)14	(—)3	(—)3	20
Uttar Pradesh	12	5	53	15	22	11	100	26	(—)10	(—)6	(—)47	(—)11
West Bengal	9	5	34	49	22	2	41	29	(—)13	3	(—)7	20
ALL INDIA	22	9	79	36	22	9	79	34	..	..	..	2

census and NSS rates generally differ widely (though not as widely as total migration), the census rates being much higher than the NSS rates. Only for rural Andhra Pradesh and urban Tamil Nadu the rates are very close and for rural Tamil Nadu and West Bengal somewhat close. Also only in the case of rural Tamil Nadu, urban West Bengal and rural and urban Kerala the NSS rates are higher than the census rates. Though the census and NSS rates differ widely the broad rural-urban pattern of higher in-migration rates for urban areas than rural areas generally holds good in the case of both rates.

3.12 As discussed above in relation to total migration the reasons for these wide differences could be manifold. Firstly, persons who have moved more than once in the last year may be sizeable and even large, though not as large as in the case of total in-migration. This would lead to a difference due to concept and definition. This difference could be due to sizeable number of return migration such as of students and persons migrating for seasonal employment. Secondly, there could have been a temporal change in migration pattern between the years preceding the 1971 census and the NSSO 28th Round, resulting from increased agricultural activity in rural areas or poorer employment opportunities in urban areas in the latter period. Thirdly, interpretation of the place of usual residence by the census and NSS field agencies might have given rise to some difference in migration.

3.13 When these in-migration rates are broken down by rural and urban areas of State of origin, the comparison shows broadly similar rates, though there are some very large differences, sometimes even NSS rates being much higher. These large differences are mostly in the migration rates from adjacent or other States from which large migration streams are generally known to originate. In these cases, the disparities seem to suggest that some particularly large migratory movements took place in the year preceding the census, or the NSSO survey, as the case may be, between the States. However, there are a few large migration streams from urban areas to rural areas, which could possibly be in the form of return migration. Only an investigation into each individual case can show whether such large scale migration actually took place or not. A more detailed analysis with break-up by age, sex and economic activity which could throw more light on these disparities could not be attempted in this paper.

3.14 The out-migration rates from census and NSS also, generally, differ widely and rural rates are generally lower than urban rates. The census and NSS rates are very close only for urban Karnataka. The rural rates are higher than urban rates for Tamil Nadu from NSS. For Kerala also, as for other States, the census out-migration rates are higher than the NSS rates, unlike the in-migration rates. The possible reasons for these disparities as discussed above for in-migration rates are also relevant for out-migration rates.

3.15 Net migration also shows wide disparities between census and NSS rates, the direction being different in several cases. Only for rural Maharashtra and Orissa the two rates are same and for rural Bihar, Punjab and U.P. and urban Andhra Pradesh and Jammu & Kashmir the differences are very wide for urban areas of Haryana, U.P., Kerala and Madhya Pradesh. For many other States the differences are quite wide for urban areas. The net out-migration from urban areas of Karnataka and Maharashtra and the large net in-migration into both rural and urban Kerala according to NSS rates are difficult to explain.

3.16 With such wide variations in the migration rates from the two sources, whatever be the reasons for them, it is difficult to arrive at a firm set of inter-state net migration rates which can be used for projections of State-wise population. Both the census and NSS surveys provide migration rates as of a particular year and hence do not give average rates which would be more appropriate for making population projection. The migration rates derived from census with duration less than 5 years or less than 10 years cannot give annual rates.

4. SRS—An Additional Source

4.1 In the SRS the household population of the sample units is updated every six months and in-migrants and out-migrants are identified. From here it would be possible to build up estimates of migration rates by pooling the data for several years. Such rates would be average rates over several years and would be more appropriate for use in population projections for States. Since the primary data already exists in the SRS Household Schedule, all that is required is to make appropriate compilations and build up the estimates. These rates could also be used to assess the quality of estimates of the migration rates from census and NSS. Thus the SRS can provide the data base not only for annual vital rates but also for migration rates.

5. Suggestions for Better Utilisation of Demographic Data Base

5.1 So far SRS data have been used only in a limited way for estimating annual fertility and mortality rates. The Civil Registration System has not shown much improvement in spite of all the measures taken to improve it. The SRS, therefore, would continue to provide vital statistics for at least some more time. It is, therefore, appropriate to exploit SRS to the maximum extent.

5.2 In the SRS household schedule information is collected on marital status and household membership status of household members. As already mentioned, these items of information have not been made use of directly. From the marital status, it would be possible to build up estimates of annual marriage rates which are not available at present. The household membership status identifies in-migrants and out-migrants to the household and the sample unit. As pointed out earlier, from these sample migrants migration rates can be worked out. Also the information on birth order collected in the SRS has not been made much use of. This could also be utilized and annual series of birth rates by birth order can be compiled. These could prove very useful for family planning programme.

5.3 Apart from these items of information very limited use has so far been made of the available longitudinal data for a fixed set of sample households under SRS. Cohort studies of fertility, mortality and nuptiality could be usefully made from the SRS longitudinal data. Survival rates for young ages could be built up, from deaths to cohorts of births, which could be used in life table construction. Such rates though based on a relatively small sample are likely to be more accurate than rates now being used for construction of life tables. Again, since births and deaths data are available in SRS separately for rural and urban areas, it is also possible to work out mortality rates and life tables separately—for rural and urban areas.

5.4 The above mentioned in-depth analysis of SRS data is feasible only through computerisation of the entire SRS data. With such computerisation it should be possible to trace cohorts over time for undertaking meaningful cohort analysis.

5.5 While the SRS can be exploited to yield all these useful data, the NSSO surveys can provide data on other demographic aspects such as cause of death, morbidity etc. besides detailed data on fertility, mortality and migration. In-depth analysis of these detailed data would bring out the relationships between these and socio-economic factors. The three major sources, viz., population census, SRS and NSSO demographic surveys together can thus be utilised to develop a much more sound demographic data base for the country.

5.6 Apart from the utility of the separate data from these three sources, it would be possible to use the combined data from these sources provided they are consistent with each other. Such detailed analysis of available demographic data will be generally feasible only after large scale computerisation is adopted to build up the demographic data base in the country.

6. Conclusion

The statistical system in India generates a lot of demographic data. This has expanded further in the last two decades through new sources like the SRS. In the absence of a computerised data base available, data are not often analysed in depth especially in regard to longitudinal data collected from SRS. Considerable amount of data is being collected under the SRS on an annual basis on fertility and mortality which could be used to provide current levels and trends. The quality of these data has to be assessed regularly to improve its reliability. The potentiality of the data collected under SRS should be fully exploited through cohort studies. This would however require computerisation of the SRS data. Large scale computerisation of demographic data could yield a much more sound demographic data base for the

country. The analysis reveals that there is also scope of improving the quality of the data being collected under SRS. An independent evaluation of SRS data at regular intervals of 3-4 years in each state is considered desirable.

6.2 There is also a need for regular evaluation and indepth comparative analysis of demographic data available from different sources. A preliminary comparison of data on internal migration available from census and NSSO surveys reveals a large number of apparent inconsistencies. This needs to be reconciled through further detailed analysis and thereafter reliable rates of migrations should be arrived at.

References

1. Paper 1 of 1981, Provisional Population Totals, Series 1, India, Census of India, 1981.

2. Registrar General and Census Commissioner, "Census of India", 1971 — Series I, Migration Tables Part IID (i).

3. Mukherjee S. R. & Banerjee S. K. "Some aspects of internal annual migration in India", Sorvekshana, Vol. II No. 2, October, 1978, pp. 23-24.

4. Srinivasan K. "A Reappraisal of the Recent Trends in Growth and Vital Rates of Population in India Based on the 1981 Census Count", The Journal of Family Welfare Vol. XXVIII No. 2, p.p 17-33, December, 1981.

5. Mukerji S. "Natural Increase and Migration as Components of Population Growth: Indian Union and Major States", The Journal of Family Welfare, Vol. XXVIII No. 2, Dec. 1981 p.p. 34—43.

6. Mukerji S. "Under—Enumeration in Indian Censuses: Impact of Inter-Censal Population Growth", Economic and Political Weekly, Vol. XVII Nos. 46-47, November 13—20 1982, p.p. 1870—1875.

7. Visaria P., and Visaria L. "Indian Population Scene after 1981 Census: A Perspective" Economic and Political Weekly, Vol. XVI Nos. 44, 45 & 46, Special Number 1981, November, 1981, p.p. 1727—1780.

8. Dyson T., "Preliminary Demography of 1981 Census" Economic and Political Weekly, Bombay, 15 August 1981.

9. Census of India, 1981, "A Note on the Post Enumeration Check, New Delhi", August 1982.

10. Srivastava, S. C., Migration in India, Census of India 1971, Paper No. 2, of 1979, Office of the Registrar General of India, New Delhi.

OPPORTUNITIES FOR RESEARCH AND ANALYTICAL WORK FROM THE AVAILABLE DEMOGRAPHIC DATA IN INDIA

MAHENDRA K. PREMI

Among the three main sources of demographic data—the population census, civil registration, and sample surveys—the census is the major source in India particularly because the civil registration system has continued to remain deficient even though it is more than a century old. The population censuses through the various publications have provided data on size, distribution, structure, and growth of population for every decade right from 1872. National and regional level sample surveys have also provided very useful demographic information from time to time, particularly since Independence.

Several types of analytical studies-demographic, economic and social-anthropological—have been undertaken in the past starting from 1881. The demographic studies relate to the analysis of the growth of population, construction of age and life-tables, and the estimation of fertility and mortality rates; and the social anthropological studies relate to exploration of social diversities of the population like the work on languages and dialects, on castes and associated cultural rituals, and on the understanding of ethnic and cultural differentiations within the country. Attention to the problem of huge numbers and possibility of rapid growth was drawn in the past by Wattal (1916), Ganguli (1938), National Planning Committee of the Indian National Congress which was appointed in the 1930s under the chairmanship of Jawaharlal Nehru. Since Independence attention has, however, been concentrated on issues relating to increasing population growth rate, employment and unemployment, structure of the working force, urbanization and migration besides generation of current estimates of birth and death rates. In this respect data from the National Sample Survey have been widely used besides those of population censuses.

The issues relating to the need for population research as well as the priority areas have been considered at several occasions in the past. For example, in his Presidential address at the Second Annual Conference of the Indian Association for the Study of Population, Mitra (1976) stressed the need for research of the differential rates of growth of the scheduled tribes, scheduled castes, and other backward classes, he also emphasized research on issues relating to National Population Policy announced by the Government of India in April 1976. Again, in a Seminar on "Problem of Relevance in Social Science Research" held at the Institute of Economic Growth, Delhi in April 1980, Mitra (1980) spoke on the "Relevance of Research on Population Problems in the Field of Social Sciences" and Desai (1980) spoke on "The Case of Research on Population Problems in India". The Eighth Annual Conference of the Indian Association for the Study of Population held in New Delhi in December 1982 devoted one full session on "Priority Areas in Population Research". On one hand this Conference emphasized the need for developing a demographic data bank in the country at regional levels, on the other hand it stressed more on issues relating to the quality of life of the people rather than on quantification of growth or certain other characteristics alone. The Conference also felt the need of relating population research with the programmes of social and economic development in the country.

In this paper, starting with the innovations in the recent Indian censuses, I propose to describe very briefly the National Sample Survey and the Sample Registration Scheme, and then discuss research studies involving (1) development of methodological or analytical tools, and (2) the inter-relationships among the demographic variables themselves or with other social and economic variables.

Innovation in the Indian Census

The 1981 population census is the twelfth decennial census of India and the fourth since Independence. The Census Commissioners have, over time, introduced several innovations to catch the reality of the changing socio-economic situation in the country by introducing new questions as well as new schedules and by expanding the tabulations. The 1961 census introduced several innovations over the 1951 census. During the house listing operations which precede the actual census count and helps in carving out the enumerators' blocks, a houselist schedule was introduced where in information was collected on the use to which a census house is put, the material of the walls and the roof, the number of members in the household, the number of rooms possessed by it, etc., at the time of actual census operations, a new schedule called the household schedule to collect information on land tenure and household industry, and another relating to "scientific and technical personnel" were introduced. There were some new questions like details of the place of birth-rural or urban, district, and state, and duration of residence at the place of enumeration. In order to bring uniformity in the application of definition of urban areas in different states, it was made more specific and simultaneously, more stringent. The concept of worker was changed from "income" approach to "work" or "labour-input" approach.

While serious attempts were made in the 1971 census to keep uniformity with the 1961 census schedules and concepts and definitions, but certain changes were still introduced. Instead of continuing emphasis on land tenure and land holdings, the emphasis shifted

to collecting detailed information on industrial establishments of all sizes wherein information was obtained on the nature of product manufactured or serviced, extent of employment, type of energy source, etc. The scope of the schedule on scientific and technical personnel was enlarged by covering all degree holders and technical or non-technical diploma holders after the completion of high school. Questions were added in the individual slip on "place of last residence" besides "place of birth" and "duration of residence at the place of enumeration". The question on literacy and education was spilt into two parts: (a) whether the person is literate or not, and (b) exact education level in case of literate persons. In order to estimate fertility of currently married women, questions on "age at marriage" and "any birth in the last one year" were introduced. The question on work was modified significantly to have more accurate estimates of the labour force by recording main activity of each person as to whether he was a worker or a non-worker. Besides his main activity if a person was engaged in some other activity also which could be regarded as work, record of the same as "secondary work" was made with similar details as for the main activity of workers [for more details, see Srivastava (1972)].

In the 1981 census three schedules the Houselist, the Household schedule, and the Individual Slip have been canvassed. Another schedule, the Enterprise list was also canvassed on behalf of the Central Statistical Organization which would be processing the data of this schedule. Identification particulars of the census houses, the uses to which they are put the number of members in each household and the number of physically handicapped persons, if any, were recorded in the Houselist. The Household schedule and the individual slip were canvassed in February-March 1981. In the first part of the Household schedule information was collected on such items as household size, number of couples living in the household, housing condition and amenities available to the household, tenurial status, land and household cultivation. Part II of the Household schedule contains the list of members of household and their demographic, economic and social characteristics.

The Individual Slip of the 1981 census was also divided into two parts-universal items which were canvassed for every person and a set of sample items relating to (i) fertility and (ii) migration which were canvassed only in 20 per cent of the sample blocks. In the universal items, a question on "school attendance" was added. The economic questions in the 1981 census were modified to provide a comparative estimate of workers with both the 1961 and 1971 censuses. A new item "seeking/available for work" was added to the economic questions to get an estimate of unemployment.

Information on migration, age at marriage, and fertility was obtained in the sample part of the individual slip. A new question on "reasons for migration" was added here. Similarly, questions on "number of children ever born" and "number of children surviving" (by sex) for ever-married women were newly introduced. The tabulation programme of the 1981 census has been greatly expanded compared to the 1971 census (Census of India 1981, 1980: 7-16) to provide vastly more information to the users of the census data out the comparability between the 1971 and 1981 censuses has been lost at the tabulation stage on several counts. For example, 1981 census will not provide the distribution of workers for each village or census enumerator's block in urban areas in the nine industrial categories. From the view point of migration analysis, there is significant change in the 1981 Tabulation Plan compared to 1971 tabulation; there is no table relating to industrial classification of migrant workers, or on sex, age, marital status of the migrants by duration of residence at the place of enumeration.

Availability of the Census Data

The Indian Census materials are published at three levels: (1) All India Reports (forming series 1 of the Census of India series), (2) State and Union Territory Reports (series 2 to 32), and (3) District Census Handbooks for each district. While the all India reports present census data at the national, state and sometimes, at the district level, the state reports give information at the state, district and tehsil/taluka levels and the District Census Handbooks give important details for each revenue village for the rural population, and enumerator block for the urban population.

The published volumes of the earlier censuses have provided the most accessible data on general, economic and social characteristics of the people of India at regular intervals. The 1971 census data were published in seven series of basic tables, namely general population tables, economic tables, social and cultural tables, migration tables, establishment tables, housing tables, and fertility tables besides special tables on scheduled castes and scheduled tribes, and on degree holders and technical personnel. In the 1981 census all the above sets of tables will be generated except the last special tables; the housing tables have, however, been divided into two sub-series: (1) tables on houses and disabled population, and (2) household tables (Census of India 1981, 1980: 3-16).

In the 1971 census, the office of the Registrar General and Census Commissioner, India (ORGCC) prepared (i) a one per cent sample tape, and (ii) a 10 per cent rural and 20 per cent urban sample tape. In the 1981 census computer tape on 5 per cent sample has been prepared for advance tabulations of the census results. Other data will be processed on the basis of 20 per cent sample for both rural and urban areas. For specific inquiries, it is possible to have additional tabulations beside those generated by the ORGCC on request.

The National Sample Surveys and The Sample Registration System

In the absence of dependable data from the civil registration system, alternative methods have been devised for the estimation of vital rates on a current and continuous basis. The National Sample Survey Organization (NSSO) made a beginning to collect nationwide information on current and historic fertility as part of its regular socio-economic inquiries. During 1958-68, population surveys of the single round retrospective type become an integral part of its annual rounds, but they were later discontinued. In such surveys information on events occuring to the members of the sample households during the 12 months preceding the enquiry were collected. The NSSO conducted a comprehensive survey of population, fertility, family planning, and mortality in its Twenty-Eighth Round (1973-74), but the vital rates derived from that round have been found to be grossly underestimated. Results of other rounds of the NSSO have also suffered from substantial recall bias (Premi, 1982:34).

In order to have regular and reliable estimates of birth and death rates at least at the state level, the office of the Registrar General and Census Commissioner (ORGCC) introduced in 1964 a pilot scheme of sample registration in the rural areas of selected states. Later, the scheme was extended to cover both rural and urban areas in all the states and union territories. The sample Registration Scheme (SRS) is a dual record system in which events are continuously recorded as they occur by a local Registrar and a survey is conducted every six months by a supervisor covering all the households in the selected areas to make an independent list of events. As the sampled villages/urban blocks have remained fixed for a number of years in the SRS, it provides very valuable longitudinal data for them.

The results of the SRS inquiries are published regularly in the serial publication *Sample Registration Bulletin* of the office of the Registrar General, India. Results of the special inquiries conducted in 1972 and 1979 have been published separately (ORGCC, 1976; 1980; 1982). Some of the states have also brought out their own publications on the SRS.

Methodological and Analytical Studies

In the absence of reliable vital registration statistics census data have been used in the past and continue to be used to construct life tables and to estimate birth and death rates at the national, zonal and state levels although questions relating to their quality, particularly relating to sex and age distribution, have been discussed in all the actuarial reports of the census actuaries and in the age tables of the 1961 and 1971 censuses besides individual researchers (Coale and Hoover, 1958, UNECOSOC, 1967; Natarajan, 1982; Swamy, 1982).

Census data have also been used to estimate the mean age at marirage at the state and district levels basing them on Hajnal's (1963) methodology and its modification by Agarwala (1962). As the Indian census data have strong tendency for heaping of age on certain preferred digits, it has always been necessary to smooth the age data. However, these smoothing exercises need to be expended further to smooth the data on school-going population, labour force, and marital status of women aged 10-35 which, in turn, can help in generating valid single year enrolment rates, labour force participation rates and proportion of women who are unmarried at each age in the above range respectively.

India being a vast country, many of its states are bigger in population size than majority of the countries in the world; hence, state level estimates of birth and death rates conceal the differences which exist in them at lower levels. The sample size of the SRS, however, is still not large enough to provide district level estimates of birth and death rates. These rates can, however, be obtained from the SRS at regional levels (each state being divided into three to four regions). Recently, Mukerji has developed a methodology of adjusting civil registration at district level to get more valid estimates. Other indirect methods of estimating the vital rates including infant mortality rates need to be developed in future to understand changes in fertility and mortality at district and lower levels.

Mean age at marriage at the district level has been estimated in the past by Hajnal's (1953) method utilizing census data on age and marital status under the assumption of no mortality from birth to the age at marriage. There is, however, a need to develop a more appropriate methodology for the estimation of mean (or median) age at marirage. The methodology based on "decade synthetic cohort" (Agarwala, 1962) also needs to be improved further to obtain better estimates. It may be useful to utilize some other related data from the census or sample surveys to improve the estimation procedures.

Although the SRS is based on a dual record system in which every effort is made to net all the vital events in the sampled areas, still the vital rates of the SRS suffer from a certain amount of underreporting, that is, events are missed both by the local registrar as well as the supervisor. Whereas no systematic evaluation of the SRS has been made at the national level, certain studies conducted in selected areas in the past throw light on the extent of omission of the events. An intensive inquiry to evaluate SRS was conducted in 1966-67 in the rural areas of Kerala and in 1973-74 in the urban areas of Andhra Pradesh to find out the extent of omission of vital events which gave the following results :

Percent events omitted by SRS

	Births	Deaths
Kerala (Rural) 1966—67	8·0	5·0
Andhra Pradesh (Urban) 1973—74	7.7	9·2

The Committee on Population and Demography, U.S. Academy of Sciences, estimated an under-re-

porting of births in the SRS of about 8 percent during 1970-73 (Swamy, 1982: 15). Similarly, Suguna Kumari (1981.8) concludes that it would not be very wrong in making a 10 percent correction for under-estimation of birth rates in the SRS. She also concludes that deaths were missed to a lesser extent than births in SRS; hence the under-reporting of deaths could reasonably be assumed to be of the order of 5 percent (Suguna Kumari 1981 : 9). Considering these findings it is necessary to develop appropriate methodology to evaluate the efficiency of the SRS.

Estimation of Net Migration

With the tabulation of migration data by place of last residence and duration of residence at the place of enumeration, it is possible to estimate net inter-censal migration at the state level. The net inter-censal migration can also be estimated indirectly by utilizing either the census survival rates or the life table survival rates when data by age are available for two succesisve censuses. There is a need to undertake studies comparing these estimates and to arrive at valid estimates of the net inter-censal migration.

While the 1961 and the 1971 tabulations provide information on the inmigrants in each district, it has not been possible to have an estimate of outmigrants particularly when they cross state or national boundaries. However, estimation of net migration at district level is becoming more and more important owing to planning needs and need for arriving at valid districtwise projections. These estimates may also help in deriving more accurate estimates of birth and death rates. Hence, efforts should be made to develop suitable methodology for estimation of net migration at the district level.

With the collection of data on place of birth, and place of last residence of the migrant, along with his/her place of enumeration, it is now possible to analyse the extent of return migration, step migration, and non-migrants, at least, at the state level if the data are cross tabulated by place of birth, place of last residence and place of enumeration. Effort may be made to generate such three-dimensional migration matrices which would shed important light on these aspects.

Comparability of the 1981 Census Estimates of Workers with those of the 1961 and 1971 Censuses

While defining a worker in the 1961 and the 1971 censuses, the usual status as well as current status approaches were adopted with reference period of one year and one week for seasonal and for regular work respectively. At the 1981 census the usual status approach is adopted uniformly for all work. In the 1961 census, a person qualified as a worker if he/she had worked regularly during the last season or if he/she had worked at least for a day in regular (non-seasonal) work during the preceding fortnight. At the 1971 census a person was treated as a worker only if he/she spent his/her time mainly in work or if he/she worked at least for a day in regular (non-seasonal) work during the preceding week. In the 1981 census, a person is classified as main worker if he/she was engaged in work for at least 183 days in the year preceding the date of census taking. Those who worked for some time during the last year but not for the major part have been treated as marginal workers. It is expected that the main workers of the 1981 would correspond to the main workers of the 1971 census, and the main plus marginal workers of 1981 would correspond to the workers of 1961 census. There is a need to undertake exercises at the state and district levels for males and females separately to confirm the same. A comparative study of the size of the working force after adjustments for conceptual differences can help in making projections of the working force for future dates. Certain analytical studies should also be undertaken by changing the order of categorization of workers from cultivators, agricultural labourers, household industry and other work into some other order.

With the introduction of new question on "seeking/available for work", it has become possible to estimate directly the extent of unemployment in the country. The census estimates may be compared with those obtained in the various rounds of the NSS and other sources. If the rates prove to be somewhat reliable, analysis of unemployment should then be taken up at the district and lower levels for males and females in the rural and urban areas separately and should be correlated with developmental educational and other socio-economic factors.

These are a few suggestions for methodological and analytical studies. It is but natural that this list is not exhaustive. Other researchers may find other interesting and priority areas for analytical studies which can surely be added to this list.

Research Opportunities Concerning Demographic, Economic and Social Characteristics

I shall now describe certain other opportunities for population research which may interest people from different social science disciplines besides the mathematical demographers.

Students engaged in the study of problems related with regional development and comprehensive area planning find the national and state level aggregations as inadequate since district is being increasingly used as the unit for area planning, and developmental activities are being operationalized even at the level of the block/tehsil. Considering this aspect Raza and Premi (1977 : 70-81) have indicated the levels at which various types of statistics are needed from regional planning perspective. Some of these statistics are available right at the villages/urban block level but there is need to bring out the relevant statistics at the appropriate level of aggregation. The data on social amenities available for each village from the 1961 and 1971 census, and the ones that will soon become available from the 1981 census should be utilized for understanding the pattern of development of planning units at different levels over time.

Urban Studies

In the census a settlement is classified as urban if it meets the criteria laid down for this purpose, the rest of the settlements are classified as rural. There are, however, a large number of settlements, particularly small towns and large villages, which form an intermediate category and may be named as semi-urban. In order to catch the Indian reality it is suggested that attempts should be made to evolve appropriate definitions of semi-urban and urban for use in future censuses so that most of the tables could be generated subsequently on the basis of this trichotomy instead of present dichotomy.

The 1981 census has indicated a much faster urban growth than the earlier censuses or what was assumed by the Expert Committee (Census of India 1971, 1979) to obtain rural urban projections. In order to understand the urbanization pattern during the 1970s, it would be useful to analyse the decadal urban growth into its components. In this respect it would be important to analyse the role of accession of peripheral areas into the city/town as a consequence of expansion of municipal boundaries.

Related to the above problem is the problem of development of new towns in the country. In fact, this aspect of urbanization may be studied since Independence so as to analyse the role of developmental planning in the evolution of new towns. Such an analysis would also help in testing the applicability of existing locational theories in the Indian situation, or in discovering a new one which fits to the current urban growth pattern.

The District Census Handbooks provide information regarding occupied residential houses, number of households, total population, literate and educated persons, population of scheduled castes and scheduled tribes, and workers classified by broad industrial categories at the enumerator's block level for each city/town. This information can be used for social area analysis and the study of changing ecological structure of the cities and towns.

A large number of cities and towns in India have a very high sex ratio (males per 100 females), say above 130. In contrast, there are cities and towns where the sex ratio favours females. As the life pattern of the people in these two categories of cities is likely to be different, it would be useful from sociological viewpoint to study their socio-demographic characteristics and to conduct surveys to understand more fully their cultural millieu.

The 1971 census introduced a new concept of "standard urban area" which is defined as the projected growth area of a city or town (with population 50,000 and over in 1971) as it would be in 1991 taking into account not only the towns and villages which would get merged with the central city in the next twenty years and also the intervening rural space. Such tracts include all extra-municipal urban growth such as the suburbs (both residential and industrial), railway colonies, civil lines, cantonments, and also those villages and towns which are likely to be urbanized by 1991 (Census of India 1971, 1975. Table A-V of the 1971 census provides information on area of each unit and its population since 1951. Similar table will be published in 1981 census. Studies based on this information alongwith that contained in the primary census abstracts and in the housing tables may prove very rewarding from the point of view of city planning and suburbanization.

Rural Studies

In the Indian census, villages are classified by size of their population and the number of persons living in them. The changing pattern of the distribution of villages in different size classes over time in different regions can help in understanding the impact of rural development projects on population growth and possibly, of the creation of new rural settlements. Further, since there are a large number of villages with over 5,000 population each, it would be rewarding to make a detailed study of their location, the characteristics of their population, and of forward and backward linkages with urban and rural settlements.

The census has been providing information on the availability of certain types of social amenities in each village in its village directory and characteristics of the population in the primary census abstracts which are the basic components of the District Census Handbooks. This information over time can be utilized to develop indicators of social and economic development at the village level as well as to understand changes therein.

Working Force

I have already pointed out the differences in the definition of workers in the 1961, 1971, and 1981 censuses and about the need for undertaking comparative studies on the size of the working force. Here I intend to describe certain other studies relating to the working population which can be taken up by social scientists.

Since 1961 the census has been providing information on the cross classification of workers other than cultivators and agricultural labourers by their educational attainment and type of occupation. Although some studies have been undertaken in the past, but it would still be useful to understand the interface of education with the nature of occupation which the individuals follow especially in urban areas. A comparative analysis over time may lead to richer dividends.

The pattern of female participation in industrial activity has fluctuated widely according to the concept of worker adopted in a particular census. However, the pattern is also affected by her age and marital status. It would, therefore, be useful to analyse the work activity of females by their age and marital status as also the industrial category in which they are engaged.

As the workers in the 1981 census are classified by their main activity and marginal activity, it would be useful to compare the industrial and occupational distribution of the two categories of workers and to examine the differentials if any, in their sex-age distribution; or in educational attainment.

Studies Relating to Family and the Household

Data have been collected in the 1981 census in the Household schedule on the composition of each household. The tabulation by household composition and its size when classified by headship—whether male or female—can provide important sociological information. Distribution of the households according to the number of couples is a new information and will be quite useful to determine the extent of joint or extended households. It would also be useful to understand the regional variations in it. As part I of the household schedule contains information on land holding, it is easy to test the hypothesis that the phenomenon of joint family is highly associated with land-holding. The data of the census when combined with other sources can also be used to determine the nature of relationship between the number of couples in the household and the extent of adoption of family planning.

As indicated earlier, the half-yearly surveys in the SRS provide information on the usual members of the households. As the sample villages of the SRS have remained constant over time, the data on household composition are amenable to longitudinal studies relating to family life cycle which has remained an unexplored area. These data can also be used to estimate the mean age at marriage of both males and females. They can also be used to analyse the shifts in age at marriage of the newly weds, if any, in different regions of the country.

School Attendance and Educational Attainment

The 1981 census introduced a new question on school attendance in the individual slip. Such data were earlier available from a census of schools or from educational surveys conducted by the Ministry of Education and Culture. Thus census, for the first time, would provide independent enrolment statistics by sex, age, level of education, and rural urban residence at state and district levels. Tables will also be generated separately for the scheduled castes and the scheduled tribes populations. These data can be utilized to analyse the educational progress of children belonging to different groups and in different regions. They can also be used for comparison of the census information and the one collected by the Ministry of Education.

The 1981 census would also provide cross tabulations for children in the age group 5-14 regarding their school attendance and economic activity. Thus, for the first time, information would be available about children by single year age who carry out some economic activity along with their schooling and who are not able to go to school owing to being engaged in economic activity and would be very useful to take ing corrective measures in specific areas. This analysis separately for the scheduled castes, scheduled tribes and the remaining children at the district level will be very rewarding.

Detailed information on educational attainment is now available from the 1961 and 1971 censuses at the district level for the total population and for the scheduled castes, and the scheduled tribes by rural urban residence. Similar tabulations will become available from the 1981 census also. These data can be analysed to discern the changes in the levels of educational attainment over time for persons belonging to different groups. One can also analyse the level of educational attainment of the numerically preponderant scheduled castes and tribes on the basis of 1981 census tabulations.

Internal Migration

With the addition of question on "reasons for migration" the 1981 census will provide additional information on migrants. The suggested tabulations are however, restricted to state level tables and for cities with population of one million and above. Hence, pattern of migration at the district level as in the 1971 census or for each city with population of 100,000 and above will not be available. Moreover, the use of different age groups in 1981 census in comparison to 1971 census will restrict the comparability of analysis over time.

Utilizing the data of the 1971 census, analysis can be made of the pattern of migration to the cities non-city urban and to rural areas. Similarly, one can compare the characteristics of the migrants to the cities, non-city urban, and rural areas with those of the non-migrants. Such analysis will throw important light on the differentials in the migrant characteristics and may be used to determine the future migration pattern. The 1981 census data can be used to make analysis for the metropolitan cities and states/union territories only unless fresh tables comparable to the 1971 census are generated from the sample tapes which will become available in due course.

Migration tables of the 1981 census can also be used to estimate net rural to urban migration at the state level which will indicate the contribution of this factor in the urbanization process in each state and union territory. A comparative analysis with the 1961 and 1971 estimates of net rural to urban migration will throw additional light on this phenomenon.

Studies on Fertility

The scope of the fertility tables has been greatly enlarged in the 1981 census compared to the previous census by the introduction of two new questions, but all these tables are restricted to the state/union territory level, hence, no detailed regional picture of fertility differentials can emerge from these data. At the state level these data will provide estimates of total fertility as well as current birth rates for people of each religious faith, scheduled castes, scheduled tribes.

non-scheduled groups, by rural and urban residence and also by educational attainment of the women.

The 1981 census will also provide information on children surviving (by sex) among total children born to ever-married women by their religion, scheduled castes, scheduled tribes and non-scheduled group status, educational attainment and work status of women, and their rural/urban residence. This information will bring the sociological differentials in the survival pattern and would be of great significance from policy point of view.

The data can also be used to analyse the shift in the age at marriage by present age of ever-married women by their religion, scheduled castes, scheduled tribes, and non-scheduled groups by rural and urban residence.

It would be useful to compare the census estimates with those obtained in the SRS to cross-check the validity of each.

Studies on Housing Stock and Households

The household table of the 1981 census will provide useful information on the nature of housing stock in the country for rural and urban areas as well as for all cities with population 100,000 and over. Information will also be tabulated on the availability of certain basic amenities like source of drinking water, electricity, toilet facility, etc. These data can be used to analyse the extent of availability of proper housing in different parts of the country. They can also be used in constructing social indicators of development at the district level for the city urban, non-city urban, and rural areas. Information on the number of couples in a household, number of living rooms per household, and number of persons per living room (all part of the household tabulation programme) can be utilized in the development of social indicators.

The household tables also provide information on the number of main workers and number of persons seeking/available for work in a household by its size. for the scheduled castes, scheduled tribes, and total population separately for rural and urban areas at the district level. The analysis of these data will point towards the extent of employment and unemployment in different types of households which would be very important information for planning purposes. If the information could be related with the number of adult members in the households or with the number of couples, it would probably become still more meaningful.

Besides the above aspects, there will be special tables for the scheduled castes and the scheduled tribes (some of them will be for each caste or tribe separately) presenting information on the economic activity of the main and marginal workers, the main workers, in special occupations, the sex, age and marital status, distribution of the people of each caste or tribe as well as the level of their educational attainment. These data can be utilized to understand the comparative progressiveness of each caste or tribe in different states and union territories. As most of this information is proposed to be published at the district or even tehsil level as well as for each individual town, the data will bring out the regional variations among the different castes/tribes and within each caste/tribe (Particularly in the case of numerically preponderant ones) quite sharply. Although these tabulations are second priority, but as and when they become available, they would provide very useful information for developing appropriate programmes for the uplift of the various castes/tribes, particularly the ones that have suffered most in the past.

Civil Registration Data

As indicated earlier, although the civil registration system in India is more than one century old, it still suffers from gross under registration of vital events of births and deaths. Further, there is no system of registration of marriages and their dissolution. Hence information from civil registration system is of limited value. The office of the Registrar General however, publishes regularly birth rates, death rates, infant mortality rates separately for the rural and urban areas of each district that fall in the registration area. Similarly information on birth rates, death rates and infant mortality rates are published for each city and town with population 30,000 and over. It would be useful to consider these statistics for each areal unit on a time series basis to find out if they exhibit any regularity and, if so, effort may be made to build certain correction factors (even if they are different for different areas) so that some valid estimates of these vital rates are obtained at the district level and for each town for which information is separately published.

Conclusions

This paper has listed a number of research proposals based on census and other demographic data which might invite the attention of hard core demographers as well as social science researchers in India. The list is not exhaustive and cannot be so in a small paper like this. Many of the suggestions in this paper can probably become the basis for a series of census monographs. The censuses of other countries in the South-Asian region have their own tabulation programmes and their own vital registration system. Based on the availability of data in different countries of the region, some of the research issues may emerge for cross-country studies wherein international organizations like the ESCAP, East-West Population Institute, Population Council, World Bank etc. might find interest. This paper, however, represents only some initial thinking but can be expanded further with some collaborative effort.

References

Agarwala, S.N. 1962—*Age at Marriage in India.* Allahabad: Kitab Mahal.

Census of India 1975—1971 Series 1, India, Part II-A (i), *General Population Tables.* Delhi : Controller of Publications.

Census of India 1979—Series 1, India, Paper 1 of 1979, *Report of the Expert Committee on Population*

Projections, New Delhi : Demography Division, Office of the Registrar General, India.

Census of India 1980—1981 *Tabulation Plan*. New Delhi: Registrar General and Census Commissioner, India, Ministry of Home Affairs.

Coale, Ansley J. and Edgar M. Hoover 1958—*Population Growth and Economic Development in Low—Income Countries*. Princeton : Princeton University Press.

Desai, P.B. 1980—The case of research on population problems in India. Paper presented at the Seminar on "Problems of Relevance in Social Science Research. "Delhi Institute of Economic Growth, April, (mimeographed).

Ganguli, B.N. 1938—*Trends in Agriculture and Population in the Ganges Valley* London: Methuen & Co.

Hajnal, John 1953—Age at marriage and proportions marrying. *Population Studies* 7(2), November.

Mitra, Asok 1976—Presidential Address, Second Annual Conference of the Indian Association for the Study of Population. Bangalore : Institute of Social and Economic Change. December, (mimeographed).

Mitra, Asok 1980—The relevance of research on population problems in the field of social sciences. Paper presented at the Seminar on "Problemes of Relevance in Social Science Research." Delhi Institute of Economic Growth, April, (mimeographed).

Natarajan, K.S. 1982—Sources and quality of Demographic Data. Paper presented at the Seventh Annual Conference of the Indian Association for the Study of Population. Tirupati : Sh. Venkateswara University, January : (mimeographed).

Office of the Registrar General and Census Commissioner, India (ORGCC) 1976—*Fertility Differentials in India* 1972. New Delhi: Vital Statistics Division, Office of the Registrar General and Census Commissioner, India.

1980—*Survey on Infant and Child Mortality. 1979-A Priliminary Report*. New Delhi.

1982—*Levels, Trends and Differentials in Fertility* 1979. Delhi: Controller of Publications.

Premi, Mahendra K. 1982—*The Demographic Situation in India*. Papers of the East-West Population Institute No. 80. Honolulu: East-West Center.

Raza, Moonis and M.K. Premi 1977—Scale of data for studies in regional development in Ashish Bose, Devendra B. Gupta and Gaurisankar Raychaudhuri (eds.) *Population Statistics in India*. Delhi : Vikas Publishing House Pvt. Ltd.

Suguna Kumari, G. 1981—Recent Trends in Population Growth. New Delhi : Central Statistical Organisation (ISS Training Unit), (mimeographed).

Srivastava, S.C. 1972—*India Census in Perspective*. Census of India 1971, Census Centenary Monograph No. 1, New Delhi : Office of the Registrar General, India.

PAPERS OF SESSION II

NEW ESTIMATES OF INFANT AND CHILD MORTALITY LEVELS AND TRENDS IN INDIA

P. N. Mari Bhat

One of the great uncertainties in Indian demography is the level and the course of mortality in infancy and childhood. Though the rate of mortality at this stage of life is widely accepted as a sensitive index of socio-economic progress, until recently there was no firm basis for its estimation. It hardly needs to be repeated here that the figures based on either Civil Registration or National Sample Surveys (NSS) grossly understated the actual levels of mortality in early years of life. Uncertainties about their levels also meant uncertainties regarding the actual level of the birth rate prevailed.

This report makes use of four major sources of information for the estimation of recent levels and trends in infant and child mortality in India: tabulations of infant mortality rate and death rate under age five ($_5M_0$) from Sample Registration System (SRS), available mainly for the period after 1970; 20th round of NSS conducted during 1965-66; a 1972 Fertility Survey, and a 1979 Infant and Child Mortality Survey, both carried out in SRS sample units. Of these, the latter three permit the indirect estimation of child mortality from informations collected on children everborn and children surviving to women. The mention may also be made of a fifth category of source—census fertility inquiries and demographic sample surveys conducted in different parts of the country at various times. A detailed analysis of the data provided by these is beyond the scope of this paper; we have, however, at various places in this report introduced estimates computed from some of these surveys to help to resolve inconsistencies among the major sets of estimates.

I. Direct Estimates of Infant and Child Mortality Levels from the Sample Registration System

Unadjusted data from the SRS for the period 1970-77 are presented in Table 1. Age-specific death rates for 1977 were not available at the state level, hence $_5M_0$ values for this year could not be included in Table 1. Also omitted in Table 1 are the data for 1973 and 1974 because of evidence that SRS performance during those years was below standard.[1]

The data presented in Table 1 reveal that at the all-India level infant and child mortality rates have remained virtually unchanged during the 1970s. However, when state-specific values are examined some exceptions to this are apparent. Some southern states—Karnataka, Kerala, Tamil Nadu, and also Maharashtra—show some signs of falling infant and child mortality levels. Curiously enough, states with considerably higher infant and child mortality levels than the above states—Rajasthan, Orissa, Uttar Pradesh and Madhya Pradesh shows either constant or increasing infant mortality levels and much smaller reductions in childhood mortality.

Unfortunately, data given in Table 1 are not unambiguously interpretable, for the SRS was just beginning in some areas in 1970-72 (especially in urban areas) and therefore data for these years may be liable to greater error than those fo later dates. Relatively larger reductions in $_5M_0$ values apparent in Table 1 probably reflect the operation of such a bias In early years of the SRS there was perhaps a spurious inflation of death rate at 0-4 age interval because the tendency to round age upward during this age span would deprive this age interval of its lowest mortality segment. With the passage of time this bias has probably reduced since age of a person in biannual SRS surveys (which provide the base for rate computation) is determined by adding 6 months to the age previously recorded.[2] Thus the improvement in data quality has probably led to spurious rise in registered infant mortality rates in some states but has overstated the reductions in childhood mortality.

The SRS is of limited use in ascertaining trends in infant and child mortality before 1970. Given below are the registered infant mortality rates for 1965-66 and 1970-72 in rural areas of the four states in which the SRS has been in full-scale operation since 1965-66. The figures for 1965-66 are taken from Agarwala (1969).

Infant Mortality Rate (Rural)

	1965-66	1970-72
Gujarat	147	151
Kerala	74	61
Karnataka	106*	103
Maharashtra	101	109

*Relates to 1966-77.

With the possible exception of Kerala no sign of significant reduction in infant mortality is observed in the above four states. Further analysis also suggests that this is essentially true even in the states in which the operation was only on a pilot-scale in mid-1960s. The evidence, of course, is subject to the qualification that the SRS had just begun in the mid-1960s, and whatever decline has occurred may have been masked by the improvements in enumeration. No data are available from the SRS to ascertain the trends in $_5M_0$ values in the late 1960s.

1. In 1973 the regular half-yearly survey for July - December was Postponed and combined with the half-yearly Survey for January-June 1974. At about the same time, SRS local budgets came under increased stress which may have inhibited (such as through transport restriction) the enumeration of vital events. The registered infant motality and child mortality rates for 1973 and 1974 are relatively low compared to other years.

2. we owe this point partially to the Office of the Registrar General, India.

8—5 RGI/ND/84

DEM-130

Thus the impression one gains from the SRS is that of constant mortality in infancy and childhood since the mid-1960s, except for some southern states, and possibly Punjab in the north, where their levels were probably falling.

II. Indirect Estimates of Childhood Mortality from CES/CS Data

Since the publication of *The Demography of Tropical Africa,* the Brass-type estimation of childhood mortality from children ever-born and children surviving data (hereafter referred to as CEB/CS data) has become a standard demographic procedure for measuring mortality levels in early years of life. Among the several variations of the procedure available, throughout most of this report, Trussell South model coefficients for converting CEB/CS data into life table parameters have been used (Trussell, 1975). The selection of South model life table as the standard was guided by the following consideration: from virtually any data set, India has high mortality below age 5 relative to mortality above age 5. The two model life table systems having this feature in the Coale-Demeny set of model life tables are the "East" and the "South" (Coale and Demeny, 1966). Of these two, the South was found to be far more representative of SRS relations between ${}_1q_0$ and ${}_5M_0$ for the large majority of Indian states. Some background information on the three surveys which permit the indirect estimation of childhood mortality from CEB/CS data is given below.

The questions on children ever-born and children surviving were asked in regular rounds of the National Sample Survey (NSS) from 16th (1960-61) to 23rd (1968-69). These informations were again gathered in the 28th round (1973-74). Unfortunately, published tabulations of these data are available from two rounds only: for urban areas of all-India from the 16th round (India, Cabinet Secretariat, 1967), and from the 20th round for both rural and urban areas (India, National Sample Survey Organisation, 1975). Information available from the 20th round, conducted during 1965-66, proved to be extremely important in understanding the course of mortality in childhood in India. Using a self-weighting design at the state level, this survey covered a total of about 154,000 households in rural areas and about 93,000 households in urban areas of India. In keeping with a rather unfortunate practice of the NSSO, the tabulation at the state level was restricted to Hindu households only. The CEB/CS data from this survey are tabulated by effective duration of marriage; the duration intervals used are 0-5, 6-9, 10-15, 16-25 and 36 and above.[3] Since these intervals are unconventional, a new set of multipliers developed by Hania Zlotnik was used in the conversion of CEB/CS data into life table parameters (see Appendix A).

The 1972 Fertility Survey was conducted in 25 per cent of the households in the SRS sample units and covered about 128,000 households in rural areas and 50,000 households in urban areas (India, Registrar General, 1975). The CEB/CS data from this survey are tabulated by age intervals of ever married women. These data are already subject to a rigorous analysis by Tim Dyson (1979). Except for some minor changes, estimates quoted in this report are essentially from his study.

The 1979 Infant and Child Mortality Survey covered all households in the SRS sample units. An advance report based on a 25 per cent of the households in each sample unit was available at the time of writing this report (India, Registrar General, 1980a, 1980b). Age was the indexing variable used in the classification of the CEB/CS data.

(a) *All-India Estimates*

Table 2 presents estimates of q(x) (probability of dying before reaching age x) derived from CEB/CS information collected in the above surveys. It may be noted that the all-India estimates from the 1972 Fertility Survey are not computed directly from the figures given in the Registrar General's publication but are derived as weighted averages of state-specific values of dead and surviving children.[4] Computations based directly on the source data consistently give results well below the state average [except for q(1)], and it was not possible to identify the source of the discrepancy. The "graduated" values of q(2) are derived by identifying the level of mortality within the South model life table system corresponding to q(2), q(3), and q(5) and taking the value of q(2) in the model life table located at the average of those levels.[5] The time periods to which the various estimates of q(x) relate have been computed using the Coale-Trussell procedure (Coale and Trussell, 1978). These time

---

[3]Effective duration of marriage was determined by relating reported age at first cohabitation to reported current age in the case of married women, regardless of how many time married, and to reported age at termination of marriage in the case of widowed, divorced or separated women.

[4]In particular, the state values of children ever born and children surviving per mother by age as given in India, Registrar General (1976) for rural and urban areas were weighted by the number of ever-married women by age in urban and rural areas (India, Registrar General, 1977). The only areas that could not be included in this calculation because of the absence of fertility/mortality data were Sikkim and Nagaland which consititute about .001 of the total population.

[5]In particular, the logit of p(x) is subtracted from the logit of p(x) in the south model life table of level 11, the average logit difference from the standard is then used to derive the graduate q(2) values. The graduation helps in ironing out the fluctuations in rq(x) estimates due to either sampling or non-sampling errors. This is recommended only when q(x) values do not suggest a decline in mortality in the immediate past, as is the case here. While graduating we have ignored the estimates of q(1), as it is typically biased upward due to age of mother and birth-order diffierences in child mortality. The estimate of q(10) was also ignored in order to keep the effect of recall lapse to a minimum.

periods could not be computed for the 1965-66 NSS because of its irregular tabulations; however, they should not be significantly different from the ones estimated for the later surveys.

A striking feature of the estimates presented in Table 2 is that, while comparison of q(x) values *within* surveys fails to reveal any real decline in child mortality (as indicated by the approximate constancy of estimated "levels"), comparison across surveys reveals substantial decline in child mortality, especially between the 1965-66 NSS and the 1972 Fertility Survey. This contradiction was not a product of the choice of model life table systems but persists regardless of which system is used. The main possible explanations are that a real decline in mortality was masked by the increasing omission of dead children by older women when q(x) values of the same survey are compared; or that a spurious decline is implied when estimates from the NSS and other surveys are compared because of either underestimation of mortality in the other surveys or overestimation of mortality in the NSS.[6] By showing little trend, the major additional source of data—SRS child death rates—gives some support to the latter possibility, although it is not very informative for the earlier period.

According to our estimates, under a regime of declining mortality the graduate value of q(2) refers to a period approximately four years before the survey. Thus, the graduated value of q(2) from the 1965-66 NSS relates to about 1961, that of the 1972 Fertility Survey to about 1968, and that of the 1979 Infant and Child Mortality Survey to about 1975.[7] If the estimates from the three surveys are comparable, then the implication is that the probability of dying before one's second birthday declined from 0.225 in 1961 to 0.154 in 1968 and further to 0.125 in 1975. Such a huge decline in child mortality between 1961 and 1968 would have had to occur in a period of modest economic gains, one that saw at the end a resurgence of malaria in many parts of India.[8]

Two differences in the manner in which the surveys were conducted could have exaggerated the appearance of mortality decline between 1961 and 1968. One is a difference in questionnaire design. In the 1965-66 NSS, enumerators first asked each woman "number of children born alive but since dead" and then "number of children now alive" and "total number of children." The 1972 Fertility Survey reversed the order of the first two questions. Unlike the 1965-66 survey, it also asked separately about the number of children now living at home and the number now living elsewhere. It may therefore have elicited more living children, while the reordering of questions may have reduced the number of dead children reported. Both tendencies would have reduced estimated mortality. It should be noted that the 1979 inquiry asked only "total children born alive" and "total children surviving" without a direct question on the number of dead children or on the number of children living at home or away. The absence of these specific questions has probably biased downward the total volume of mortality as well as of fertility estimated from the 1979 survey. Also this survey was probably subject to another kind of bias: there have been suggestions that the intensive family planning drives of the late 1970s have generated suspicions about the interviewers intentions in demographic surveys and have led to downward biases in the reported parity and surviving children.[9]

The second difference is that the 1972 Fertility Survey results were tabulated by age and the 1965-66 NSS were tabulated by duration of marriage. Indirect estimation procedures should work about equally well in the two cases. However, data by duration of marriage were reported not only for currently married women in their first marriage but also for remarried women and separated, divorced, or widowed. Remarried women were treated properly from the point of view of mortality estimation: their duration of marriage was recorded from the date of first marriage to the survey data. However, the other women were assigned their marital duration at the time of disruption, so that the inferred amount of exposure of their children to the risk of mortality is biased downward. We have done a relatively extensive simulation of the possible magnitude of this bias in the all-India figures from the NSS because of its potential importance. We have assumed that the age structure of the ever married female population is that of a "West" stable population with a growth rate of .02 and mortality level 8. Female marriage occurs at age 16. Husbands are assumed to be 5 years older at marriage and to have mortality level 11. With no remarriage, the proportion of people reported at duration 0-5 by the NSS tabulation would include 15 per cent who are widowed and really belong to higher intervals; the figures are 16 per cent at 6-9 and 17 per cent at 10-15. These people would have married, on the average, 25, 28, and 32 years before the survey, which is an upper limit on the exposure of their children to mortality. Adopting a West model life table, they bias upward the proportion of children dead (and associated q(x) values) by 12 per cent, 14 per cent, and 11 per cent respectively. A majority of this bias, however, is eliminated by allowing remarriage, the frequency of which for women in India is adapted from Bhat and Kanbargi

[6]In the investigations of couple fertility of the NSS, stillborn babies were included in the calculation of children ever born to a woman. The analysis presented here however, is based on the information collected in the 12th Schedule of the NSS, which according to the survey from does not include stillborn babies.

[7]. It should be noted that the graduated q(2) values do not refer exactly to the stated calendar years but to time periods whose midpoints are the stated years.

[8]. During the period 1961-70, net national product at constant prices increased at an annual rate of 3.3 per cent and gross value of output from agriculture at 2.5 per cent (India, Central Statistical Organisation, 1975a, 1975b), while the population increased at a rate of 2·2 per cent.

[9]. As pointed out to us by Pravin Visaria in a Private communication.

(1981). After adjustment for remarriage, the bias in proportion of children dead at 0-5, 6-9, and 10-15 years of marriage is, respectively, 4.2 per cent, 5. 9 per cent, and 1.1 per cent. The graduated q(2) value computed from these adjusted figures is 0.261. This could explain only a small fraction of the 46 per cent difference in graduated q(2)'s between the 1965-66 NSS and the 1972 Fertility Survey; however, the bias could be larger (or smaller) in certain states.

A cross-check is also possible to ascertain the magnitude of the bias in child mortality estimates derived from the 1965-66 NSS. The CEB/CS data from the 16th round of NSS (1960-61) available for urban *currently* married women has been tabulated by age (India, Cabinet Secretariat, 1967). The estimates of q(x) values computed from this data could be readily compared with those derived from the 1965-66 NSS for urban India.[10]

Source	q(2)	q(3)	q(5)	q(10)	Graduated q(2)
1960-61 NSS (16th round)	.209	.213	.224	.294	.192
1965-66 NSS (20th round)	.176	.194	.231	.281	.178

The above comparison gives strong support to the relatively high values of child mortality found in the 1965-66 NSS for all-India. Apparently, the classification of widowed, divorced, or separated women according to their marital duration at the time of the disruption has not lead to significant distortions in the estimates of q(x) values derived from the 1965-66 NSS.

However, before pronouncing the final judgment on the all-India estimates of child mortality, it may be worthwhile to examine the state-specific estimates produced by these sources.

(b) *State-Specific Estimates*

The estimates of q(x) values computed from the CEB/CS data of the 1965-66 NSS and the 1972 Fertility Survey of 15 major states of India appear in Table 3 and 4. Due to the non-availability of data, state-specific estimates of child mortality from the 1979 Infant and Child mortality Survey could not be made. In the case of the 1965-66 NSS, the requisite tabulations at the state level were available for Hindu households only (whereas the national figure was presented for all religions combined). The estimates of child mortality derived from this survey are therefore strictly applicable only to the Hindu population of the respective states. In 11 of the 13 major states (the exceptions are Punjab and Kerala), more than 70 per cent of the population is Hindu[11]. As we demonstrate below, the estimates of child mortality derived from the 1965-66 NSS for Punjab and Kerala, where the Hindu proportion is low, seem to be largely consistent with the estimates derived from other sources. Inconsistencies are seen mainly in the estimates for certain other states, where the proportion of Hindu population is high.

Without losing much information, we may focus our attention only on graduate q(2) values computed from the estimates of q(2), q(3), and q(5). In passing, however, we may note that the comparison of q(x) estimates presented in Tables 3 and 4 reveals that q(x) estimates derived from the 1965-66 NSS are internally more consistent than those from the 1972 Fertility Survey, giving one reason for placing more confidence in the estimates derived from the 1965-66 NSS.

The graduated q(2) values derived from the 1965-66 NSS and the 1972 Fertility Survey are very consistent in their rank ordering of states, with northern states generally showing higher levels of child mortality than southern states (the correlation coefficient is 0.76). The figures also imply a large decline in child mortality in the states of Haryana, Bihar, Maharashtra, and Karnataka (more than 40 per cent). A reduction by one-third or more is also implied in the states of Kerala, Tamil Nadu, Uttar Pradesh, and West Bengal. Whether these huge reductions in child mortality are real or spurious is difficult to ascertain. As we have seen above, the little internal evidence available from the SRS does not support a large decline in child mortality, at least in the late 1960s.

In the states in which a very large decline in child mortality has occurred, the estimates of q(x) values from the 1972 Fertility Survey should imply progressively higher levels of mortality as x increases. To examine whether this is actually the case, we have computed graduated q(2) values from q(2) and q(3) estimates as well as from q(5) and q(10) estimates, under the assumption of a South model mortality pattern (see Table 5). Except for Kerala, none of the states in Table 5 shows any sign of a large reduction in child mortality in the years preceding the survey. In fact, for most states, the possibility of an increase in child mortality is indicated, perhaps due to more underreporting of dead children among older women or to an incorrect choice of the South model pattern.[12]

[10]. In the 16th round of the NSS, the CEB/CS data were tabulated by age categories of 17-21, 22-26, etc. The regression coefficients used in converting this information into q(x) values are shown in Appendix B.

[11]. The all-India data of the 1965-66 NSS indicate that child mortality among Hindus is slightly higher than that of the total population—the graduated value of q(2) for Hindus is 0.231, and for the total population it is 0.225. The corresponding values for Muslims and Christians are 0.206 add 0.156, respectively. Relatively low child mortality among Christians may be at least partly due to the fact, that they reside in relatively low mortality areas, such as Kerala and Assam.

[12]. To some extent the implied increase in child mortality is also the result of graduation. An example may help in clarifying this : for q(10) value of 0.197, q(2) value in the south model life tables (both sexes) is 0.154, but the logit transformation using south model level 11 (both sexes) as the standard yields an estimate of q(2) of 0.143.

However, unless progressive increase of under-enumeration of dead children with age of mother was greater in the states in which the reduction of child mortality was greater, we should still expect a high degree of correlation between the intra and inter-survey ratios of graduated q(2) values. The fact that this correlation is only +.21 casts some doubt on the validity of a huge decline in child mortality in the 1960s.

III. Consistency Check Analysis of the State-Specific Estimates of Child Mortality

Table 6 shows a comparison of the graduate q(2) values from the two surveys to the q(2) values implied by the SRS infant mortality rate and the death rate below age five, ${}_5M_0$. In transforming the SRS rates into q(2) estimates, the South model mortality pattern was assumed to be applicable and a suitable correction was applied for the fact that ${}_5M_0$ values from the SRS are weighted by the age distribution under age five.[13] The estimates presented in Table 6 show a high degree of correspondence in both level and geographic pattern between the graduated q(2) values derived from the 1972 Fertility Survey and those computed directly from the SRS rates. The coefficient of correlation between the state-specific estimates from the 1972 Fertility Survey and the averages of the two estimates from the 1970-72 SRS is 0.97. But this high degree of consistency may in part be the consequence of the use of the same infrastructure in the collection of data.

It can be observed from Table 6 that in several states—Assam, Gujarat, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal—the estimates of q(2) values derived from the SRS infant mortality rates of 1970-72 are higher than those computed from the 1972 Fertility Survey. The use of another model pattern such as West or East could have reversed this ordering, but it is important to notice that q(2) estimates derived from ${}_5M_0$ which are reduced by the choice of the South pattern are usually even higher. Keeping also in view of the fact that the estimates from the 1972 Fertility Survey refer to slightly earlier date, the possibility that the 1972 survey has understimated child mortality in some of these states cannot be ignored.

Several other tests were made to evaluate the 1966 and 1972 surveys. Table 7 presents state-specific rural-urban estimates of q(2) values (graduated) from the 1972 Fertility Survey and the 1965-66 NSS. This table also shows urban-rural differences in female literacy by state and an index of the urban bias in health services. Estimates from the 1972 Fertility Survey for the states of Haryana, West Bengal, and Kerala imply negligible rural-urban differentials in child mortality. The relatively small difference in urban and rural child mortality levels in Kerala can be justified on the grounds that its rural and urban females are almost equally literate and that the state has the most equitable distribution of health services between rural and urban areas. Also lending support is the small urban-rural difference in child mortality from the 1965-66 NSS. In the states of Haryana and West Bengal, however, little independent evidence is forthcoming for accepting the 1972 Fertility Survey estimates. In West Bengal, medical services are relatively better distributed between rural and urban areas, but there is a large gap between rural and urban literacy levels. It seems more credible that the 1972 Fertility Survey has underestimated child mortality in the rural areas of these two states.

Child mortality estimates for the state of Bihar from the 1972 Fertility Survey are also of questionable validity. While the implied rural-urban differential is large, it is doubtful that child mortality in rural areas of Bihar is even lower than the level prevailing in the urban areas of neighbouring Uttar Pradesh; nor is it likely that among the urban areas of India urban Bihar has one of the lowest child mortality levels. By advancing similar arguments, it is also possible to throw suspicion on the estimates of child mortality derived from the 1965-66 NSS for the rural areas of Bihar, Gujarat, and Orissa. In this context it is significant that child mortality estimates from the 1965-66 NSS for the state of Gujarat fall below even the range indicated by the 1970-72 SRS (see Table 6). In Karnataka and Maharashtra, where the implied decline in child mortality was largest, we have not uncovered any evidence to suspect the 1972 Fertility Survey estimates.

As a second test of the CEB/CS data, state-specific estimates of child mortality were compared with respective socioeconomic levels and with independently computed adult mortality levels. More specifically, two ordinary least-squares regressions were computed, one with q(2) regressed on female literacy (15 years and over) and per capita income as explanatory variables, and the other with intercensal estimates of life expectancy at age 5(e_5) as the regressor. The residuals from these two regressions were examined for identifying outliers. For convenience a decadal estimate of child mortality was used as the dependent variable, which was computed by giving a weight of 5/7 to the graduated q(2) estimate from the 1972 Fertility Survey and a weight of 2/7 to the estimate from the 1965-66 NSS[14]. The estimated equations

---

[13]. The "level" of mortality implied by the ${}_5M_0$ values of the SRS is identified by comparing it with the ${}_5m_0$ values in south model stable populations (both sexes) with a growth rate of 0.020 and varying "levels" of mortality. The q(2) value in the south model life table (both sexes) corresponding to the identified "level" is taken as the requisite estimate.

[14]. Since the graduated q(2) of the 1972 Fertility Survey refers to 1968 and that of the 1965-66 NSS to 1961. The estimated reference dates of the graduated q(2) values of all-India are also roughly applicable to the state-specific estimates The differences among states in age specific parity distributions are too small to have a significant impact on the estimates of the time references of the q(x) values.

along with the standard errors of the coefficients are given below.

(1) $1000q(2) = 260.86 - 2.0148\ FLIT\ (0.7194)\ 0.1934\ INC\ (0.1220)$ $(R^2 = 0.54)$

(2) $1000q(2) = 675.73 - 9.2352e_5\ (3.2325)$ $(R^2 = 0.39)$

The "studentized" residuals from the above regressions are shown in columns 5 and 6 of Table 8. There is a high degree of correspondence among the residuals from the two regressions. Both comparisons indicate that the child mortality estimates are relatively low in the states of Bihar, Haryana, Karnataka and West Bengal, and they are relatively high in Uttar Pradesh and Gujarat. The evidence from the two residual analysis is slightly contradictory in the case of Maharashtra, Rajasthan, Madhya Pradesh and Tamil Nadu.

It is noteworthy that a strong geographical pattern is observed in the residuals of the child/adult mortality regression. All southern states, including Maharashtra, have relatively low child mortality estimates compared with their adult mortality levels; all central and northwestern states with the sole exception of Haryana have relatively high child mortality estimates compared with their adult mortality levels. This tendency, while boosting our confidence in the decadal estimates of mortality, reduced to some extent the significance of the individual residuals from the adult mortality regression in detecting errors in child mortality estimates.

Finally, we present in Tables 9 and 10 estimates of child mortality from independent sources in the states for which they are available. Table 9 shows the results of the census fertility inquiries converted into mortality estimates. These are valuable for showing, in every state for which estimates are available, that child mortality is estimated to be higher than in the 1965-66 NSS. If the NSS estimates were higher than those in the earlier Census Fertility Inquiries, there would be grounds for serious doubt about the NSS validity, but this proves not to be the case.

What do the foregoing analysis tell us? In our view in five states—Bihar, Haryana, Karnataka, Tamil Nadu and West Bengal—the evidence is conclusive enough to reject the 1972 Fertility Survey estimates. Our reasons for this are outlined below. In order to assess the magnitude of the bias in the all-India figures, we have also tried to assume alternative values for these states, probably at the risk of distorting the regional pattern displayed by the unadjusted figure.

Bihar

For Bihar the regression analyses strongly suggest the possibility of underestimation of mortality in the 1972 Fertility Survey. The difference between the rural and urban estimates of this survey is quite large, but, as pointed out earlier, there is a strong possibility that the survey has underestimated child mortality in both rural and urban areas. A close agreement is found, however, between the estimate of child mortality derived from the 1972 Fertility Survey and those computed directly from the SRS. However, there is compelling evidence from the tests of death registration completeness (and agreement by the Registrar General's office) that the SRS figures for this state for the early 1970s reflect serious underregistration of deaths. Overall we consider the evidence as sufficiently overwheling to justify discarding the child mortality estimate from the 1972 Fertility Survey. A new estimate is computed by assuming that the pace of the child mortality decline in Bihar was the same as that of all-India and by accepting the estimate from the 1965-66 NSS without any correction. It is possible, however, that the figure from the 1965-66 NSS for the state is also an underestimate, as it displays relatively negligible rural-urban differential in child mortality.

Haryana

There is strong evidence indicating that the child mortality estimate from the 1972 Fertility Survey for Haryana is an underestimate. Although the estimate from this survey conforms with the SRS rates of 1970-72, figures for later years from the SRS indicate the possibility that the early figures were underestimates. Unusually small rural-urban differentials in the 1972 survey estimates are in keeping with that possibility. In addition, the q(2) values predicted from the State literacy and income levels turns out to be significantly higher than the decadal estimate derived from the CEB/CS data. The residual error from the adult mortality regression for this state is negative, but all other northern states have a positive deviation. Thus the case for the underestimation of child mortality in the 1972 Fertility Survey is persuasive but the best we could do in the absence of independent data is to replace the estimate from this survey with the average of the q(2) estimates derived from the infant mortality rate and the ${}_5M_0$ value from the 1975-77 SRS.

Karnataka

The child mortality estimate for Karnataka is relatively low compared with the female literacy and income levels. In addition, a large negative residual error from the adult mortality regression cannot be wholly attributed to regional variation in the adult-child mortality relationship. But the 1972 Fertility Survey estimate for this state compares well with the rates from the 1970-72 SRS. Comparison of the 1970-72 and the 1975-77 figures does not imply any improvement in the completeness of the SRS. The computation of rural and urban figures from the 1972 Fertility Survey also shows normal patterns. Fortunately, however, some independent data exist for the state that support the possibility of underestimation of child mortality in the 1972 Fertility Survey. The Bangalore Population Study conducted in 1975 provides an estimate of q(2) (graduated) of 0.145 which

is considerably higher than the 1972 Fertility Survey estimate (see Table 10). Although the Bangalore Population Study did not cover the entire State of Karnataka, it is unlikely that the child mortality rate in the study areas was higher than in other parts of the state. The child mortality estimate from the 1972 Fertility Survey was replaced by an estimate computed in the following way: Average annual decline in child mortality was calculated from the estimates of q(2) derived from the Bangalore Population Study and the Mysore Population Study conducted in the same region (see Table 10). This rate was applied to the graduated q(2) value from the 1965-66 NSS to produce an estimate for 1968, the reference date of graduated q(2) values from the 1972 Fertility Survey.

Tamil Nadu

The child mortality estimate derived from the 1972 Fertility Survey for Tamil Nadu is considerably lower than that computed from the 1970-72 SRS. The residual from the e_5 regression is also negative, which is at least partly explained by the possible regional variation in the adult-child mortality relationship. Fortunately, in Tamil Nadu we can also make an independent estimate of child mortality. The CEB/CS data from a statewide survey conducted in 1971-72 produces a graduated q(2) value of 0.165, compared with the value of 0.136 from the 1972 Fertility Survey (see Table 10). The estimates derived from a 1971-72 survey in some villages of Madurai and Coimbatore districts are also significantly higher than the estimates produced by the 1972 Fertility Survey for rural areas of this state (see Table 10 and Table 7). We have accepted the level of q(2) implied by the 1971-72 state-wide survey as it is more comparable to the estimates derived from the SRS 1970-72 for this state.

West Bengal

The child mortality estimates from the 1972 Fertility Survey for West Bengal is lower than those computed from the 1970 SRS. Moreover, the early figures from the SRS for this state were themselves underestimates (Preston *et al.*, 1979). Large negative residuals from regression analyses and the small rural-urban difference in estimated child mortality also suggest underestimation in the 1972 Fertility Survey. The much higher 1965-66 NSS figure is still much lower than those of the 1951 census inquiry. In the absence of an independent data source, we accepted the q(2) estimate corresponding to the infant mortality rate of the 1970 SRS.

Although for other states we accept child mortality estimates from the two surveys without correction, figures for most of the states are not above suspicion. For Assam and Gujarat, both surveys produce lower estimates of child mortality than those derived from the SRS (see Table 6). However in Assam, application of death registration completeness techniques also suggests significant overregistration in the SRS (National Academy of Sciences, 1983). For Gujarat no such indication is available but the residuals from the regression analysis imply that compared to the state's socioeconomic and adult mortality levels, even the indirect estimates derived from the surveys are relatively high. For these two states estimates from an independent source are badly needed, especially to confirm whether the 1965-66 NSS has underestimated child mortality.

In Maharashtra and Uttar Pradesh, the possibility that the 1965-66 NSS has overstated child mortality needs to be further explored. In both states the comparison of the graduated q(2) values derived from the 1965-66 NSS and the 1972 Fertility Survey indicate huge reductions in child mortality during the 1960s. The checks carried out above do not suggest significant underestimation of child mortality in the 1972 Fertility Survey.[15] But they are of little value in testing for the possibility of overestimation of child mortality in the 1965-66 NSS. Although in Maharashtra region, several demographic surveys were conducted in the 1950s and early 1960s, the analysis is hindered by the classification of the CEB/CS data according to age of male head of the household, and broad and irregular age categories utilized in its tabulation. Two studies conducted in rural Uttar Pradesh in the mid-1950s do suggest the possibility of overestimation of child mortality in the 1965-66 NSS (see Table 10), but their relevance is questionable due to limited geographic coverage or sample size.

Among other states, the estimates for Kerala and Punjab from the 1965-66 NSS are suspect as they refer only to Hindus. The child mortality estimates from the 1972 Fertility Survey for Rajasthan and Madhya Pradesh are probably on a lower side as indicated by their comparison with the SRS estimates for 1970-72.

IV. Conclusion

Our adjusted estimates of child mortality for the states as well as all-India appear in Table 11. In only 5 of 15 states did we find the evidence sufficiently strong for rejecting the estimates derived from the CEB/CS data of the 1972 Fertility Survey. The five states for which alternate values were assumed were among the eight states for which comparison of the 1965-66 NSS and the 1972 Fertility Survey indicated a decline of child mortality of one-third or more. At the all-India level, assuming alternate values for five states did not substantially reduce the magnitude of the implicit decline in child mortality during the 1960s. The estimates of q(2) of 0.164 for 1968 and 0.225 for 1961 imply a 27 per cent reduction in seven

[15] In Uttar Pradesh, however, the comparision with the SRS rates does suggest slight underestimation of child mortality in the 1972 Fertility Survey. Large positive residuals from the regression analyses cautioned us against considering the estimates from this survey as low. It is however quite possible that certain cultural and ecological factors make child mortality unusually high in this region.

years. However, if for the 1965-66 NSS a corrected figure of .216 for misclassification of widowed, divorced, or separated women is assumed, the implied reduction falls to 24 per cent. The graduated q(2) of 0.125 from the 1979 survey implies a decline of 25 per cent over the subsequent seven-year period, so that the pace of decline appears relatively constant. However the decline is most probably overstated for the latter period because through a state-specific analysis we have been able to adjust upward the earlier estimate but not the later one. Analysis has also suggested that the quality of the fertility data collected in the 1979 survey is unsually poor (National Academy of Sciences, 1983).

We have pointed out earlier to the discrepancy between the strong implied decline in child mortality when the estimates from the 1965-66 NSS and the 1972 Fertility Survey are compared, and the absence of any such indication when q(x) estimates of the 1972 Fertility Survey are compared among themselves. By accepting the q(2) estimates from both surveys for most states, we have obviously leaned toward the hypothesis that the older women were omitting a higher fraction of dead children in the 1972 Fertility survey. Some confirmation of this was obtained when the P/F method was applied to the 1972 survey data (see National Academy of Sciences, 1983).

It may be noted that the regional pattern of results may be somewhat less accurate after the adjustments to the 1972 Fertility Survey estimates than before. Because of the availability of independent survey information in several states (especially Karnataka and Tamil Nadu), we have been able to adjust their 1972 Fertility Survey estimates. Had similar information been available for other states, it may have produced similar adjustments. Nevertheless, the regional pattern, particularly the north-south distinction, appears in both our adjusted and unadjusted results.

This report clearly demonstrates the utility of Brass-type questions in estimating child mortality levels in an Indian setting. Even at this late stage, the publication of the CEB/CS data from the later rounds of the NSS may help to shed further light on the trend of child mortality in the 1960s. The publication of the statewise data from the 1979 survey, and the tabulation of the similar informations collected in 1981 census and in a nation-wide survey conducted by the Operations Research Group in 1980, would go a long way in fixing the actual course the child mortality had taken in the 1970s. This paper also demonstrates that the demographer's task would become much easier, and comparison of estimates across surveys become more meaningful, if standard questions and tabulation procedures are adopted.

Acknowledgement

This is a revised version of the section on infant and child mortality in the forthcoming report of the Panel on India, Committee on Population and Demography, National Academy of Sciences, Washington, D.C. The paper is written under the inspiring guidance of Professor Samuel H. Preston. His critical remarks on the data and the methods used have helped substantially in improving the quality of this paper. Comments of P. Padmanabha, Pravin Visaria, Tim Dyson, Etienne van de Walle and the Office of the Registrar General, India, were invaluable in the revision of an earlier draft. The author is, however, solely responsible for any error of omission or commission.

TABLE 1: **Infant and Child Mortality Data from the Sample Registration System, 1970—77**

State	Infant Mortality Rate			Death Rate at Ages 0—4			Data of init. of the SRS in rural areas
	1970-72	1975-77	Percent change	1970-72	1975-76	Percent change	
Andhra Pradesh	112	123	+ 10	45.0	49.1	+ 9	Jan. 1968
Assam	136	128	— 6	50.2	46.4	— 8	July 1967
Bihar	(103)	N.A.	(N.A.)	(35.6)	N.A.	N.A.	July 1966
Gujarat	141	146	+ 4	63.7	56.8	— 11	Oct. 1965
Haryana	82	113	+ 38	31.9	45.8	+ 44	July 1968
Jammu & Kashmir	86	66	— 23	25.5*	33.4	+ 31	July 1967
Karnataka	95	84	— 12	37.7	28.6	— 24	June 1966
Kerala	58	52	— 10	23.4	19.4	— 17	July 1965
Madhya Pradesh	145	146	0	54.7	62.4	+ 14	Jan. 1970
Maharashtra	101	94	— 7	40.8	33.1	— 19	July 1965
Orissa	132	141	+ 7	57.1	53.5	— 6	Jan. 1968
Punjab	107	104	— 3	39.5	35.9	— 9	Jan. 1968
Rajasthan	129	146	+ 13	62.2*	60.8	— 2	July 1967
Tamil Nadu	119	108	— 9	45.1	43.8	— 3	July 1968
Uttar Pradesh	176	181	+ 3	85.7	84.5	— 2	July 1967
West Bengal	(104)	N.A.	N.A.	(32.0)	N.A.	N.A.	Jan. 1968
All India (state weighted, excluding Bihar and West Bengal)	131	133	+ 2	54.9	53.5	— 3	

*1970 and 1972 only.

( ) for 1970; also of questionable validity.

N.A. = not available.

Source : India, Registrar General (1975b, 1972) and unpublished data supplied to Panel on India by Registrar General of India.

TABLE 2 : **Estimates of Infant and Child Mortality from the CEB/CS Data of the 1965-1966 NSS, the 1972 Fertility Survey and the 1979 Infant and Child Mortality Survey, All-India**

Age (x)	1965-66 NSS (all religions)		1972 Fertility Survey		1979 Survey of Infant and Child Mortality		Time Reference of q(x) Values (Years before Survey)	
	q(x)	South Level	q(x)	South Level	q(x)	South Level	1979 Survey	1979 Survey
1	N.A.	N.A.	0.130	13.8	.152	11.6	1.1	0.9
2	0.225	10.6	0.155	14.9	.143	15.7	2.4	2.1
3	0.251	10.7	0.175	14.7	.137	17.0	4.2	3.8
5	0.277	10.2	0.185	14.9	.145	17.1	6.4	6.0
10	0.317	10.0	0.203	14.7	.160	16.8	8.9	8.4
Graduate q(2)	0.225		0.154		.125		4.3*	4.0*

*Average of he estimates for q(2), q(3) and q(5).

N.A. = Not available.

Sources : Compiled from India, National Sample Survey Organization, (1975); Dyson (1979); India, Registrar General (1980 b.).

TABLE 3 : **Child Mortality Estimates by State from the 1965-66 NSS, Using the Regression Coefficients in Appendix A, Hindu Households only**

Per cent

State	Hindus (1961 Census)	q(2)	q(3)	q(5)	q(10)	Graduated q(2)
Andhra Pradesh	88.4	0.239	0.244	0.276	0.307	0.227
Assam	71.3	0.168	0.168	0.188	0.194	0.161
Bihar	84.7	0.250	0.275	0.280	0.314	0.241
Gujarat	89.0	0.159	0.197	0.240	0.269	0.175
Haryana	88.9	0.200	0.207	0.257	0.300	0.197
Karnataka	87.3	0.205	0.232	0.254	0.291	0.206
Kerala	60.8	0.131	0.159	0.170	0.210	0.135
Madhya Pradesh	94.0	0.264	0.277	0.314	0.361	0.256
Maharashtra	82.2	0.223	0.239	0.264	0.308	0.219
Orissa	97.6	0.274	0.238	0.278	0.318	0.236
Punjab	42.3	0.179	0.211	0.187	0.234	0.168
Rajasthan	90.0	0.250	0.260	0.299	0.361	0.242
Tamil Nadu	89.9	0.219	0.250	0.270	0.290	0.220
Uttar Pradesh	84.7	0.351	0.378	0.392	0.430	0.341
West Bengal	78.8	0.176	0.178	0.201	0.258	0.164
All-India (Hindus)	83.5	0.232	0.258	0.283	0.323	0.231

NOTE: Separate estimates for rural and urban areas were combined employing the Hindu population (1961 Census) in the respective area as weights.

Source: Computed from India, National Sample Survey Organization, (1975).

TABLE 4 : Child Mortality Estimates by State from 1972 SRS Fertility Survey, using Trussell's Regression Coefficients, on the Assumption of a "South" Mortality Pattern

State	q(1)	q(2)	q(3)	q(5)	q(10)	Graduated values of q(2)
Andhra Pradesh	0.167	0.168	0.168	0.188	0.194	0.155
Assam	0.156	0.172	0.166	0.186	0.191	0.155
Bihar	(0.038)	0.125	0.149	0.161	0.165	0.128
Gujarat	0.139	0.169	0.182	0.201	0.222	0.163
Haryana	0.121	0.111	0.105	0.131	0.144	0.101
Karnataka	0.094	0.123	0.135	0.146	0.148	0.119
Kerala	0.062	0.074	(0.218)*	0.121	0.158	0.084†
Madhya Pradesh	0.157	0.189	0.192	0.203	0.222	0.173
Maharashtra	0.113	0.137	0.146	0.145	0.182	0.126
Orissa	0.184	0.229	0.201	0.203	0.225	0.188
Punjab	(0.238)	0.145	0.136	0.148	0.192	0.126
Rajasthan	0.123	0.164	0.186	(0.319*	0.214	0.164‡
Tamil Nadu	0.136	0.162	0.150	0.149	0.177	0.136
Uttar Pradesh	0.162	0.226	0.262	0.283	0.311	0.230
West Bengal	0.095	0.113	0.127	(0.047)	0.154	0.112‡
All-India (state-weighted average)	0.120	0.155	0.175	0.185	0.203	0.154

†Based on q2 and q5.

‡Based on q2 and q3.

*Believed to be biased by a misprint in the baseline data. To be specific the proportion of children surviving to rural Keralan women aged 25—29 indicated by the figures in India Registrar General (1976:74) is out of line with both the figures of other age groups and the indications of urban women of the same age. In the case of Rajasthan, on page 75 of the same report, the printed number of children born alive to rural women aged 30—34 is unrealistically high by about one child and is out of line with the indications of other age groups; this apparent error produces the high q_5 value for Rajasthan,

Principal source: Dyson (1979).

TABLE 5 : Comparisons by State of the Estimates of q(2) Derived from the 1965-66 NSS, The 1972 Fertility Survey, and the Infant Mortality Rates and $_5M_0$ of the SRS

State	1965-1966 NSS (Hindu households)	1972 Fertility Survey	SRS 1970—1972 From IMR	SRS 1970—1972 From $_5M_0$	SRS 1975—1977 From IMR	SRS 1975—1977 From $_5M_0$
Andhra Pradesh	0.227	0.155	0.144	0.156	0.160	0.167
Assam	0.161	0.155	0.181	0.170	0.169	0.160
Bihar	0.241	0.128	0.129*	0.130*	N.A.	N.A.
Gujarat	0.175	0.163	0.190	0.205	0.197	0.187
Haryana	0.197	0.101	0.096	0.119	0.145	0.158
Karnataka	0.206	0.119	0.117	0.136	0.101	0.108
Kerala	0.135	0.084	0.065	0.091	0.058	0.078
Madhya Pradesh	0.256	0.173	0.197	0.183	0.197	0.203
Maharashtra	0.219	0.126	0.126	0.145	0.116	0.122
Orissa	0.236	0.188	0.175	0.188	0.189	0.179
Punjab	0.168	0.126	0.136	0.140	0.130	0.131
Rajasthan	0.242	0.164	0.170	0.202	0.197	0.197
Tamil Nadu	0.220	0.136	0.155	0.157	0.137	0.153
Uttar Pradesh	0.341	0.230	0.246	0.255	0.254	0.252
West Bengal	0.164	0.112	0.131*	0.119*	N.A.	N.A.
All India (all regions)	0.225	0.154				
All India (state-weighted, excluding Bihar and W. Bengal)	0.231	0.162	0.174	0.183	0.177	0.179

*For 1970 only. N.A.=Not Available. †for 1975-76.

TABLE 6 : Examination of time Trend in Child Mortality Levels by Intra And Inter-Survey Comparisons

State	Graduated Fertility Survey q(2) values for 1972 derived from q(2) and q(3) (1)	q(5) and q(10) (2)	(1)÷(2)	Ratio of graduated q(2) of 1972 Survey to 1965-66 Survey estimate*
Andhra Pradseh	0.157	0·145	1.08	0.68
Assam	0.158	0.143	1.10	0.96
Bihar	0.128	0.123	1.04	0.53
Gujarat	0.165	0.162	1.02	0.93
Haryana	0.101	0.103	0.98	0.51
Karnataka	0.120	0.110	1.09	0.58
Kerala	0.074†	0.104	0.71	0.62
Madhya Pradesh	0.179	0.163	1.10	0.68
Maharashtra	0.132	0.123	1.07	0.57
Orissa	0.202	0.164	1.23	0.80
Punjab	0.131	0.127	1.03	0.75
Rajasthan	0.164	0.157‡	1.04	0.68
Tamil Nadu	0.146	0.123	1.19	0.62
Uttar Pradesh	0.230	0.233	0.99	0.67
West Bengal	0.112	0.111‡	1.01	0.67
All-India	0.154	0.148	1.04	0.68

*Graduated q(2) values derived from q(2), q(3) and q(5).
†Based on q(2) only.
‡Based on q(10) only.

TABLE 7 : Urban-Rural Differences by State in q(2) Estimates (Graduated) Derived from CEB/CS Data

State	1972 Fertility Survey		1965-66 NSS (Hindu Households		Urban-rural difference in percent of female literacy (5 years and over) 1971	Ratio of proportion of hospital beds in rural population 1966-67
	Rural	Urban	Rural	Urban		
Andhra Pradesh	0.166	0.108	0.232	0.197	29.3	0.11
Assam	0.159	0.099	0.165	0.119	39.1	0.16
Bihar	0.139	0.072	0.246	0.229	29.8	0.28
Gujarat	0.170	0.134*	0.177	0.167	31.6	0.39
Haryana	0.103	0.091	0.207	0.149	37.0	0.25
Karnataka	0.127	0.094	0.218	0.155	31.2	0.20
Kerala	0.089†	0.071	0.135	0.132	8.1	0.44
Madhya Pradesh	0.188	0.109	0.262	0.217	36.5	0.19
Maharashtra	0.130	0.117	0.235	0.159	34.0	0.05
Orissa	0.193	0.140	0.236	0.234	28.4	0.40
Punjab	0.139	0.091	0.185	0.151	29.0	0.20
Rajasthan	0.172‡	0.111	0.250	0.196	30.1	0.20
Tamil Nadu	0.154	0.094	0.228	0.196	30.3	0.46**
Uttar Pradesh	0.238	0.158	0.352	0.249	30.8	0.14
West Bengal	0.108‡	0.105	0.175	0.136	36.4	0.48
All-India (All regions)	0.163§	0.112§	0.235	0.178	33.3	0.25§

*Based on q(3) and q(5). **Relates to 1964. (†)Based on q(2) and q(5). (‡) Based on q(2) and q(5).
§Pooled estimate for above 15 states.

Source: Computed from India, Registrar General (1975a, 1976, 1977), India, National Sample Survey Organisation (1975), and India. Director General of Health Services (1972, 1976).

TABLE 8 : Regression Analyses of State-Specific Estimates of Child Mortality for Identifying Outliers

State	Graduated q(2) values About 1966	Female literacy (15 years and above) 1961—71	Per Capita income in rupees at 1960-61 prices 1961—71	Estimata of life expectancy at age five (e_5) 1961—71	Studentized residuals from regression Model 1	Model 2
	1	2	3	4	5	6
Andhra Pradesh	0.176	14.0	290	52.9	—0.020	—0.370
Assam	0.157	19.0	341	55.2	0.013	—0.284
Bihar	0.160	7.8	211	54.3	—2.065	—0.458
Gujarat	0.166	23.3	391	56.3	1.073	0.326
Haryana	0.128	12.6	364	58.3	—1.474	—0.310
Karnataka	0.144	17.5	322	53.7	—0.689	—1.221
Kerala	0.099	51.7	273	60.7	—0.648	—0.626
Madhya Pradesh	0.197	8.8	247	54.0	0.061	0.650
Maharashtra	0.153	21.7	408	55.8	0.568	—0.235
Orissa	0.202	10.9	250	51.6	0.423	0.097
Punjab	0.138	20.1	407	60.3	—0.138	0.722
Rajasthan	0.186	7.3	284	56.3	—0.190	0.998
Tamil Nadu	0.160	21.2	330	53.9	0.200	—0.584
Uttar Pradesh	0.262	8.9	250	53.7	3.758	4.097
West Bengal	0.127	22.1	389	54.7	—0.523	—1.507

Sources and Notes: Column 1: weights of 2/7 for the estimates from the 1965-66 NSS and 5/7 for those in 1972 Fertility Survey were employed. Column 2: Computed from India, Registrar General (1965, 1977); mean of 1961 and 1971 values. Column 3: India, Reserve Bank (1978) and India, Kerala, Bureau of Economics and Statistics (1977); since the base years for Assam and Karnataka were other than 1960-61, ad hoc adjustment was made by multiplying the net domestic product at constant prices by the GNP deflator for 1960-61. Column 4: Dyson (1979), estimates based on the South model mortality pattern; male and female e_5 values were combined using the respective populations as weights.

TABLE 9: Child Mortality Estimates Derived from Census Fertility Inquiries using South Model Variant Regression Coefficients

State/Source	Geographical coverage	Estimates of*						Graduated
		$P_{(1)}/P_{(2)}$	$P_{(2)}/P_{(3)}$	q(2)	q(3)	q(5)	q(10)	q(2)
Assam								
1941 Census	Gauhati subdivision except Gauhati Thana (Hindus only)	0.1997	0.5331	0.298	0.325	0.362	0.398	0.297
Delhi	Former Delhi							
1941 Census	Province	0.2049	0.5809	0.313	0.298	0.338	0.372	0.286
Jammu and Kashmir	Jammu & Ladakh							
1941 Census	districts	0.2137	0.5421	0.285	0.244	0.345	0.309	0.261
Karnataka	Former Princely							
1941 Census	State of Mysore	0.2439	0.5577	0.249	0.262	0.288	0.340	0.239
Kerala	Travancore State							
1941 Census	(Caste groups with population less than 50,000 excluded),	0.1383	0.4750	0.168	0.165	0.173	0.216	0.150
1951 Census	Travancore-Cochin (10 per cent sample)	0.1092	0.4559	0.204	0.220	0.235	0.258	0.196
Madhya Pradesh	Former Central							
1921 Census†	Provinces and Berar	0.4518	0.6275	N.A.	0.279	0.326	0.338	0.259
1951 Census	Former state of Madhya Pradesh	0.2196	0.5776	0.356	0.352	0.397	0.423	0.339
Punjab	Former Province							
1921 Census†	of Punjab	0.3461	0.6408	0.247	0.226	0.231	0.250	0.210
Rajasthan‡	Ajmer-Merwara and							
1941 Census	about 13 princely states of Rajasthan (three major caste groups only)	0.3342	0.6399	0.335	0.334	0.352	0.388	0.309
West Bengal								
Census Pilot Study 1951	Rural ares of seven districts	0.2839	0.5767	0.242	0.254	0.269	0.304	0.232

N. A. Data not available for making the requisite computation.

*Assumptions made in computing average parities for all women in each age/duration category were too elaborate to be discussed here. The procedures varied depending on the data availability.

†Data tabulated by duration of marriage (effective); others tabulated by age.

‡The CEB/CS data classified by age intervals of 17-21, 22-26, etc.

Source: Provincial/State volumes of the Census of India for the dates indicated.

Table 10: Estimates of Child Mortality derived from CEB/CS Data of some selected Demographic Sample Surveys

State/Source	Area covered*	Data of Survey	Sample women	q(2)	q(3)	q(5)	Graduated q(10)	Graduated q(2)
Karnataka								
Mysore Population Study (United Nations, 1961)	Bangalore division, and parts of Hassan and Mysore districts	1951-52	14,284†	0.253	N.A.	0.293	N.A.	0.246
Bangalore Population Study (Srinivasan *et al*; 1977)	Bangalore division	1975	4,722†	0.136	N.A.	0.195	N.A.	0.145
Tamil Nadu								
Tamil Nadu Family Planning and Fertility Survey (Mukherjee, 1975)	Entire State	1971-72	5,435‡	0.156	0.191	0.211	0.243	0.164
Gandhigram Survey (World Health Organisation, 1976)	34 villages of Madurai and Coimbatore districts	1971-72	6,541†	0.206	0.234	0.249	0.261	0.205
Uttar Pradesh								
Banaras Survey (Rele, 1963)	Rural areas of Banaras tehsil	1956	1,633§	0.301	0.296	0.370	0.384	0.291
Rural U.P. Survey (Saxena, 1962)	Rural areas of the State	1956	1,336‡	0.351	0.305	N.A.	N.A.	0.316
Gorakhpur Region Survey (Saksena and Rastogi, 1975)	Rural areas of Gorakhpur Division	1969-71	1,296‡	0.248	0.288	0.335	0.337	0.260

*A division refers to a group of districts while a *tehsil* is an administrative sub-unit within a district.

†Ever-married women.

‡Currently married women.

§Women in unbroken marriage unions.

Note : In converting average parities of married women into average parities of all women it was assumed that widowed, divorced and separated women had the same parity as married women; childbearing is restricted to married only; and marital status distributions can be approximated by the census figures.

Table 11: Final estimates of q(.) for 15 Major States of India

State	About 1961	About 1968	Mid-Intercensal Decade
Andhra Pradesh	0.227	0.155	0.176
Assam	0.161	0.155	0.157
Bihar	0.241	0.169*	0.190
Gujarat	0.175	0.163	0.166
Haryana	0.197	0.151*	0.163
Karnataka	0.206	0.134*	0.155
Kerala	0.135	0.084	0.099
Madhya Pradesh	0.256	0.173	0.197
Maharashtra	0.219	0.126	0.153
Orissa	0.236	0.188	0.202
Punjab	0.168	0.126	0.138
Rajasthan	0.242	0.164	0.186
Tamil Nadu	0.220	0.164*	0.180
Uttar Pradesh	0.341	0.230	0.262
West Bengal	0.164	0.131*	0.141
All-India	0.225 (.234)†‡	0.164†	0.184†

*Adjusted estimates; see text for explanation.

†State estimates weighted by state's population.

‡Pertains only to Hindus.

Appendix A—Regression coefficients used in Estimating Adjustment Factors K(i) when CEB/CS data are classified by duration intervals as indicated, West Model variant

Regression equation : $K(i)=a(i)+b(i)\frac{P(1)}{P(2)}+(i)\frac{P(2)}{P(3)}$

Duration of marriage (years)	(i)	q(x)/D(i)	a(i)	b(i)	c(i)
0— 5	1	q(2)/D(1)	1.2500	—0.2555	0.0195
6— 9	2	q(3)/D(2)	1.1999	—0.2615	—0.0879
10—15	3	q(5)/D(3)	1.2322	0.0167	—0.3417
16—25	4	q(10)/D(4)	1.2561	—0.0542	—0.3722
26—35	5	q(20)/D(5)	1.1664	1.6023	—1.3668

Appendix B—Regression coefficients used in Estimating adjustment Factors K(i) when CEB/CS data are classified by Age intervals as indicated, South Model variant

Regression equation : $K(i)=a(i)+b(i)\frac{P(1)}{P(2)}+c(i)\frac{P(2)}{P(3)}$

Age interval of women	(i)	q(x)/D(i)	a(i)	b(i)	c(i)
17—21	1	q(1)/D(1)	0.5047	—0.7884	0.9352
22—26	2	q(2)/D(2)	1.0143	—0.2942	0.0936
27—31	3	q(3)/D(3)	1.0835	—0.1417	—0.0657
32—36	4	q(5)/D(4)	1.0930	—0.1025	—0.0688
37—41	5	q(10)/D(5)	1.0982	—0.1002	—0.0469
42—46	6	q(15)/D(6)	1.0727	—0.0984	—0.0303

References

Agarwala, B.L. (1969). Sample registration in India. *Population Studies* 23 (3) : 379-394.

Bhat, M. and R. Kanbargi (1981). *A Preliminary Note on Levels, Trends and Differentials in Widow and Widower Remarriages in India in the Twentieth Century.* (Unpublished report).

Coale, A.J., and P. Demeny (1966). *Regional Model Life Tables and Stable Populations.* Princeton, N.J. : Princeton University Press.

Coale, A.J., and J. Trussell (1978). Estimating the time period to which Brass estimates apply. *Population Bulletin of the United Nations* 10 : 87.

Dyson, T. (1979). *A Working Paper on Fertility and Mortality ; Estimates for the States of India.* Paper presented to the New Delhi Workshop of the Panel on India, Committee on Population and Demography, National Academy of Sciences, Washington D.C.

India, Cabinet Secretariat (1967). *Tables with Notes on Family Planning.* National Sample Survey Report No. 116. Delhi : Manager of Publications.

India, Central Statistical Organisation (1975a). *National Accounts Statistics,* 1960-61—1972-73. Delhi : Controller of Publications.

India, Central Statistical Organisation (1975b). *National Accounts Statistics,* 1960-61—1972-73 : *Disaggregated Tables.* Delhi : Department of Statistics, Ministry of Planning.

India, Director General of Health Services (1972). *Health Statistics of India* 1965. Delhi : Controller of Publications.

India, Director General of Health Services (1976). *Health Statistics of India* 1966-1970. Delhi : Controller of Publications.

India, Kerala, Bureau of Economics and Statistics (1977). *Statistics for Planning.* Trivandrum : Bureau of Economics and Statistics.

India, National Sample Survey Organisation (1975). *Tables with Notes on Birth and Death Rates and Fertility Rate.* National Sample Survey, Report No. 206. Delhi : Controller of Publications.

India, Registrar General (1965). *Social and Cultural Tables.* Census of India 1961, Volume 1, Part II-C(i). Delhi : Manager of Publications.

India, Registrar General (1972). *Sample Registration of Births and Deaths in India* 1969-70. Delhi : Manager of Publications.

India, Registrar General (1975a). *General Population Tables.* Census of India 1971, Series 1, Part II-A(i). Delhi : Controller of Publications.

India, Registrar General (1975b). *Sample Registration Bulletin* 9(4).

India, Registrar General (1976). *Fertility Differentials in India* 1972. New Delhi : Office of the Registrar General.

India, Registrar General (1977). *Social and Cultural Tables.* Census of India 1971, Series 1, Part II-C(ii). Delhi : Controller of Publications.

India, Registrar General (1980a). *Survey on Infant and Child Mortality, 1979 : A Preliminary Report.* New Delhi : Office of the Registrar General.

India, Registrar General (1980b). *Sample Registration Bulletin* 14(2).

India, Reserve Bank (1978). Analysis of estimates of state domestic product. *Reserve Bank of India Bulletin* 32(4) : 276-312.

Mukherjee, B.N. (1975). Levels of Fertility in Tamil Nadu based on survey statistics. In R.S. Kurup, ed., *Studies on Fertility in India.* Gandhigram Institute of Rural Health and Family Planning.

National Academy of Sciences (1983). *Vital Rates in India, 1961-1981.* Committee on Population and Demography, National Academy of Sciences, Washington, D.C., forthcoming.

Preston, S.H., N. Chen, and J. Hobcraft (1979). *Preliminary Report on Application of Techniques for Estimating Death Registration Completeness to Data from the Indian Sample Registration System.* Paper presented at a meeting of the India Panel, Committee on Population and Demography, National Academy of Sciences, Washington, D.C.

Rele, J.R. (1963). Fertility differentials in India : Evidence from a rural background. *The Milbank Memorial Fund Quarterly* 41(2) : 183-199.

Saksena, D.N., and S.R. Rastogi (1975). Fertility, child mortality and family planning in rural areas of Uttar Pradesh. in R.S. Kurup, ed., *Studies on Fertility in India.* Gandhigram: Gandhigram Institute of Rural Health and Family Planning.

Saxena, G.B. (1962). Age at marriage and fertility—a sample study in the rural Uttar Pradesh. *Artha Vijnana* 4(1) : 52-59.

Srinivasan, K., P.H. Reddy, and K.N.M. Raju (1977). *Changes Over a Generation in Fertility Levels and Values in Karnataka.* Occasional Paper Series No. 2. Bangalore : India Population Project.

Trussell, J. (1975). A re-estimation of the multiplying factors for the Brass techniques for determining childhoold survivorship rates. *Population Studies* 29(1) : 97-100.

United Nations (1961). *The Mysore Population Study.* Population Studies No. 34. New York : United Nations.

World Health Organization (1976). *Family Formation Patterns and Health.* Geneva: World Health Organization.

AN ASSESSMENT OF FERTILITY TRENDS IN INDIA

TIM DYSON and V. SOMAWAT

Introduction

Fertility trends in India constitute an important component of global demographic change. Almost certainly more live births occur annually in the country than in any other. And if United Nations indicators are approximately correct, then India currently exceeds China in this respect by about 4 million births a year.

The publication of the population totals from the 1981 census has occasioned an even greater degree of interest in the subject. This is mainly because the implied average annual rate of population growth over 1971-81 of 2.2 per cent annum is almost identical with that indicated for the preceding intercensal decade (1961-71). Several scholars consider that the average crude birth rate (CBR) over 1971-81 may well have been as high as 39 per thousand. And, largely as a consequence, serious concern has been expressed as to whether the family planning program has had any demographic impact at all.[1]

The present paper will critically review some of the past work on birth rate trends in India. But its main aim is to attempt to provide some new estimates—and perspectives—as to the country's recent fertility change In so doing we examine one or two hitherto largely unanalyzed data sources. Moreover we are firmly of the opinion that, for it's proper understanding, this subject requires some measure of historical perspective, as well as consideration of state-level (as opposed to All-India) fertility trends.

The paper is broadly divided into three. First we consider available sources of data that can provide us with some idea chiefly (although not exclusively) as to *national* birth rate trends. Second we consider the *state-level* picture, and forward statistics by which we can categorize states according to their recent fertility levels and trends. Finally we briefly try to present an overview of fertility change in India, bringing together, and where necessary attempting to reconcile, the various indications of the earlier two sections.

Our main argument will be that India and it's constituent states illustrate a wide diversity of fertility trends.

Indications from major data sources.

(i) *The Census*

Several sets of fertility estimates exist for India for the 1951-61 and 1961-71 intercensal decades. Invariably these have been derived from census age-distributions using conventional intercensal estimation procedures, and/or stable and quasi-stable techniques. A selection of such estimates is presented in Table 1. As can be seen, analysts generally agree in putting the CBR during the first period at around 45 per thousand, while a figure of approximately 40-42 seems to be felt appropriate for the 1961-71 decade.

Recently new figures on levels of early age mortality prevailing in the period under review have become available. These enable us to re-estimate fertility parameters for these two intercensal decades with a somewhat greater degree of allowance for the appropriate levels of child mortality. Here both forward and reverse survival procedures have been used within a slightly more flexible version of the intercensal survival technique originally suggested by Coale and Demeny (UN, 1967). Details of both the new early age mortality estimates and the present estimation procedure can be found within the report of the India panel of the U.S. National Academy of Sciences (Panel Report, forthcoming.[2]

Table 2 summarizes both the early-age mortality figures we have used and the main fertility results. For the 1951-61 decade the q^2 value of 0.236 is derived from CEB/CS data from the 1965-66 round of the National Sample Survey. It seems to be the earliest All-India child mortality estimate for which there exists any reasonable degree of direct support. However it may be better thought of as relating more appropriately to the end, rather than the midpoint, of the 1951-61 decade.[3] Therefore in order to illustrate the implications of still heavier levels of early age mortality for the decade as a whole we also present results obtained for values of q2 some 15 and 30 points higher.

As can be seen the fertility results in Table 2 generally confirm the estimates of other analysts. For the 1961-71 decade the present figures are in reasonable accord with those of Adlakha and Kirk: a crude birth rate of around 41 and a total fertility rate in the vicinity of 5.7-5.9 live births. For the 1951-61 period the estimates based on a value of q2 of 0.236 put the birth rate a shade under 45, with a corresponding TFR slightly in excess of six live births. Again, the correspondence with the earlier estimates is reasonable. However, as Table 2 also shows, higher levels of fertility for the decade can by no means be ruled out. And in any event the weak-

[1]On the level of the CBR during the 1970's Visaria and Visaria (1981) consider a figure of 39 "not an unlikely possibility"; Jain and Adlakha (1982) think the birth rate was "about 38-39 during the 1970's". For grave doubts as to the impact of the family planning program see the exchange in the *Indian Express* special supplement on the 1981 Census, published in the *Financial Express*, Tuesday, August 18, 1981.

[2]However, perhaps we might add that the 0–9 age-groups has been employed for the reverse survival estimate, and throughout a south model life table has been used. See also the notes to Table 2.

[3]It is in fact derived from CEB/CS responses of women of duration of marriage 16–25 years in 1965/66. These are difficult to time-locate precisely, see Panel report (forthcoming).

10—5 RGI/ND/84

nesses of this kind of estimation procedure should require no further emphasis here.

(ii) *Vital Registration*

Birth registration has existed in parts of India for over a century. In the past demographers have occasionally used it when studying fertility trends (e.g. Carr-Saunders, 1936; Wyon and Gordon, 1971). But recently registration statistics have rarely if ever been used in such a context—largely because of their undoubtedly poor level of coverage. In the 1970's the registered crude birth rate varied around 20. And a recent investigation concluded that only about 40% of Indian births were registered over 1961-71 (India, 1980).

However, there are reasons for thinking that registration data may merit at least some attention. First, birth coverage is certainly much better than 40% in some states. Second, unlike intercensal and 'indirect' estimates, vital registration birth rates are available on a regular annual basis. Finally, if we can assume that the degree of omission of births has remained approximately constant over time, then, of course, implied *trends* may be informative even though the *level* of registered birth rates is seriously deficient.

Accordingly, for the period since 1950 state-level CBR's from vital registration were examined with a view to studying trends. Two simple selection criteria were employed: a state's data was rejected if *either* (i) it's time-series of CBRs exhibited a pronounced *and* sustained discontinuity, *or* (ii) the level of the registered CBR for several years since 1950 was particularly low[4].

Five states—Maharashtra, Gujarat, Tamil Nadu, Punjab, Haryana—plus Delhi, passed on these basic criteria.[5] In 1978 the total population in the registration areas covered in these territories was about 160 million. And the average level of birth coverage in these states over 1961-71 appears to have been around 70% (India, 1980).

For each year since 1950 Figure 1 presents the combined birth rate for the six territories here under review.[6] It shows that the registered CBR declined marginally during the early 1950's. But it increased slightly in the late fifties and early 1960's. The timing of the onset of the birth rate decline in Figure 1 varies according to how it is defined. One could argue that 1962-65 saw the start of the reduction. But it was not until 1969-70 that the composite registered CBR in these areas fell below that of the mid-1950's. This said, there can be little doubt that a sustained decline in this birth rate was underway from the mid-1960's, and that it continued into the early 1970's. After marginal increases in 1975-76, the largest absolute change in this quarter-century series occurs in 1977. This must surely be connected, in some way, with the events of the previous year.

In examining Figure 1 it must be borne in mind that—other qualifications apart—it is based on data for only five of the country's fifteen or so major constituent states. Nevertheless, in the present context, and to aid comparability, it is perhaps worth summarizing the trends implied on a decadal basis:

Intercensal decade	Composite (CBR) (straight average)	%change
1951—61	20.5	— 1.3
1961—71	30.1	—17.2
1971—78	24.9	

The indicated crude birth rate reduction between 1951-61 and 1961-71 is marginal although as Figure 1 suggests, this could hide significant changes. But a 17% CBR decline is implied over the two periods 1961-71 and 1971-78. And, comparing the rates registered at the end points of these two periods (30.3 in 1961 and 22.4 in 1978), a 26% decline in this registered composite CBR is implied.

We will see below that, in its general implications vis a vis trends, this vital registration data is by no means inconsistent with other data on Indian fertility.

(iii) *The Sample Registration System*

For recent years the intensive dual-record Sample Registration System (SRS) provides us with a better set of estimates of All-India birth rates. These too are summarized in Figure 1. The crude birth rate for 1968 relates to rural areas only. The following year data for urban areas began to be included and this probably helps to explain the fairly substantial fall recorded between the two years. A still more pronounced decline occurs in 1973, and the CBR remains low in 1974. The SRS Bulletin itself remarks that the especially low birth rates in 1973-74 probably partly reflect the temporary suspension of the half-yearly survey in 1973, together with a marked reduction in field supervision in both years (India, 1981).

Interpretation of SRS birth rate trends over the short time period for which they are available is hazardous. As we will note below, the system's fertility rates are usually thought to be underestimates. And we have little idea of the extent of any coverage-level changes over time. But this said, there is pro-

[4]For example, over the period 1966-75 Karnataka fails on both counts. For the first quinquennium it's CBR fluctuates around 15 ('particularly low'). But in 1970 it suddenly jumps to about 27 and subsequently remains at this level ('pronounced and sustained irregularity'). In fact very many of the discontinuities in the state-level CBRs stem fairly obviously from a failure to consistently match numerator and denominator in a sensible way (see also footnote 17 below). In general much more use can probably be made of registration data.

[5]The CBRs for these states still contained four sharp discontinuities, although in each case these were restricted to a single year. These were Bombay (1955), Gujarat (1959, and Tamil Nadu (1952 and 1955). In these instances the CBR for the affected year was replaced by the average figure for the two contiguous years.

[6]Separate data for Maharashtra, Gujarat, Punjab and Haryana becomes available in 1958 and 1966 respectively. Prio to these years material for these states is subsumed under 'Bombay' and 'Punjab' (old composite state).

obably no better single source as to very recent fertility trends. Accordingly, if we exclude the 'difficult' years of 1968, 1973-74 and 1977, then the (linear) trend in the crude birth rate is that depicted by the dotted line in Figure 1. The average CBR centered on January 1971 is 37.0, compared with a corresponding birth rate of 33.8 for the beginning of 1978 i.e. a 9% decline. On the basis of the fitted linear trend the CBR reduction would be about 12% if we were to consider the entire period 1970-1980.

(iv) *Demographic Surveys*

Three sets of demographic surveys, each involving questions designed to elicit data on children ever borne and births in the last year, are relevant to the present topic. These are (a) post-censal fertility surveys carried out in several states in 1962 (referred to in the state-level section below), (b) the 1972 nationwide fertility survey (see India, 1976), and (c) the national infant and child mortality survey of 1979 (see India, 1982). Here we consider the fertility data from the latter two investigations in the All-India context.

The 1972 survey data has been analyzed several times in considerable detail using several variants of Brass P/F ratio technique (for the technique see Brass, 1975). Such analyses are complicated by the nature of the available data tabulations, and still more, because the marital status distributions from the survey are inconsistent with those from the 1971 census. In particular the percentages of women 'currently married' by age implied by the survey were considerably lower than those implied by the census.[7] Mainly for the latter reason different analysis have sometimes adopted quite different approaches to the data within the framework of the P/F technique.[8] However, as the following figures show, a reasonable degree of consensus has emerged from various analyses of the results:

Fertility Estimates from the 1972 Survey

Source	TFR	CBR
Dyson (1979)	5.7—5.9	..
Jain and Adlakha (1982)	5.75	40.6
Panel on India (forthcoming)	5.80	39.9

A total fertility rate of about 5.8 live births per woman with an attendant crude birth rate marginally over 40 emerge. The differences in the two estimated All-India CBRs must be regarded as small.[9] They imply a deficiency in the SRS birth rate in 1971/72 of 8 and 10 per cent.

Analysis of the 1979 survey results to give an estimate of the level of fertility around 1978 is also problematic. This is because by then there is every reason to believe that some measure of decline in period total fertility was underway. A measure of support for declining age-specific fertility by this time is provided by applying a clever analogue of the P/F ratio technique developed by Zaba (1981). This utilizes the relational gompertz fertility model, and compares the transformed fertility distribution implied by mean parity values (P) with that from current fertility data (F). If transformed P and F points define the same straight line, relative to a model fertility distribution, then constant fertility is implied. But divergence may be indicative of changing fertility levels.

The application of this method to the 1979 survey material is briefly summarized in Table 3 and Figure 2. The transformed current fertility points (F) in the Figure lie marginally above those based on the parity (P) data—a pattern of deviation suggestive of some degree of age-specific fertility decline (Zaba, 1981). In order to obtain an estimate of the TFR for around 1978 values of α and β in the gompertz system were derived with reference to the first five transformed parity values.[10] Ratios of observed to model parities (colmun vii) provide estimated TFRs based on the model fits. These must be regarded with considerable caution, both because fertility is probably changing, and to a lesser extent because the precise figures obtained would vary according to the fitting procedure employed. Estimates for most age-groups are broadly indicative of a TFR of around 4.9=5.0 live births per woman. There are certainly strong grounds for suspecting that the figure of 4.3—stemming solely from the data on current fertility collected in 1979—is much too low.

If the level of total fertility around 1978 was indeed 4.9≒5.0 live births per woman then this would imply a corresponding crude birth rate of approximately 35-35.5 per thousand.[11] In turn this would mean that the SRS CBR in 1978 was 5-6% too low. However, given the nature of this kind of estimation procedure it would clearly be unwise to conclude that SRS birth coverage necessarily improved between 1971 and 1978.

Lastly we should mention that Zaba's procedure was also applied to the survey data collected in 1972. However in this case the analysis revealed no evidence of change in fertility.[12]

(v) *Marriage and Family Planning Statistics*

One final approach to estimating fertility trends in India during the 1970's has recently been forwarded by Jain and Adlakha (1982). It utilizes the framework proposed by Bongaarts (1978). This expresses the

[7] A plausible explanation for the discrepancy is an enumerator selection bias in the survey.
[8] For a summary of the different approaches adopted see Panel report (forthcoming).
[9] They appear to relate partly to slightly different age distributions used.
[10] For this group 'averaging', (repeating the middle point), was employed.
[11] Following Jain and Adlakha (1982) we estimated these CBR's using an extrapolated SRS age distribution.
[12] Both P and F points defined almost exactly the same straight line. As we note in the text below, it is quite possible that any change in age-specific fertility rates occurring prior to 1972 was too small/slow to be detected by the technique.

total fertility rate in a population as the product of an index termed the total fecundity rate (TF)[13] and four indices, Cm, Cc, Ca and Ci, which measure respectively the effects on fertility of marriage, contraception, abortion and breast-feeding. It follows that changes in total fertility can be expressed in terms of changes in these latter four indices.

After a consideration of relevant data sources Jain and Adlakha assume that between 1972 and 1978 there was no significant change in TF in India. They also assume that any change in abortion was of negligible impact both because the overall abortion rate is low and because they consider that the increase in abortion registered in the official statistics primarily reflects substitution for illegal terminations. In the absence of information on the average duration of breastfeeding over the period Jain and Adlakha incorporate the effects of two sets of assumptions: (a) a two month decline, and (b) no change.

Their assessment of changes in the total fertility rate between 1972 and 1978 therefore hinge upon their estimated changes in Cm and Cc. Given the family planning statistics provided by the Department of Family Welfare the change in Cc is comparatively easy to compute. And as Table 4 (panel A) shows, family planning appears to have had the single most important impact on changes in total fertility over this period. Jain and Adlakha estimate that Cc declined from 0.864 to 0.777 corresponding to a recorded increase in currently protected couples from 13.7% in 1971-72 to 24.4%in 1977-78. However the assessment of the impact of Cm appears more problematic. This is mainly because of the aforementioned discrepancy in marital status distributions between the 1971 census and the 1972 survey. Therefore they employ two sets of assumptions in calculating cm.[14] The overall effects for changes in total fertility of these various estimates and assumptions are summarized in Table 4 (Panel B). As can be seen a reduction in total fertility of between 9 and 15 per cent is implied. Assuming that the TFR in 1971-72 was 5.75 the corresponding measure for 1978 would vary between 4.90 and 5.24 with attendant crude birth rates of 34.9 and 37.3 respectively.

The State Level

Before we present an overview of All-India fertility trends we will first consider some state-level statistics. Wo do this because an examination of possible state-level changes enables us to qualify our picture as to the likely path of national fertility. A summary of relevant state-level figures is presented in Table 5. States are grouped on a broad geographical basis, because in this, as in other aspects of India's demography, we find it is helpful to work within a regional framework.[15]

It is useful to begin with a consideration of vital registration data. The crude birth rate time-trend in Figure 1 is in fact the outcome of two relatively distinct patterns of state CBR change over time. The dominant pattern—essentially that depicted by Figure 1—was experienced by the three larger states involved i.e. Maharashtra, Gujarat and Tamil Nadu. In each of these the registered CBR fell during the early 1950s, reaching a minimum during 1956-58. The birth rates in each state then increased to peak during 1962-65, and thereafter a fairly steady fall set in. As a result of these movements the average CBR over the two decades 1951-61 and 1961-71 shows only marginal change. To illustrate this dominant pattern the continuous line in Figure 3 depicts the registered crude birth rate trend since 1950 for Maharashtra and Gujarat combined [16]

The second pattern of birth rate change is that exhibited by each of the remaining territories i.e. Punjab-Haryana and Delhi. In these the registered CBR shows a fairly steady downward trend from about the late 1950's. As Figure 4 indicates, the fall appears to have been especially pronounced in Punjab (although there is a certain flattening of the trend since the mid-1960's).[17]

Indications from census data as to trends in fertility over the period 1951-71 are very limited, and complicated by the fact of substantial-yet rather uncertain-mortality change. State-level intercensal estimation for 1951-61 especially problematic (Adlakha, 1979). But Table 5 contains estimates so derived for the 1961-71 decade by the India panel (note the broad north/south fertility-level division that is implied).

---

[13]The total fecundity rate is thought to vary between 13 and 17 among populations.

[14]Difficulties in calculating Cm also spring from differences between the marital status distributions implied by the 1979 survey results based on a 25% sample of households. and those based on *all* nouseholds in the 1979 sample. The matter is further complicated because the age-specific fertility rates for 1972 published in India (1976) seem to differ somewhat from those published for 1972 in India (1982). Moreover, for both 1972 and 1979 surveys only processed data are published on a rural urban basis. Therefore weighting of the published results is required. Calculation of Cm in both years is also complicated by exact assumptions as to the treatment of marital fertility in the 15–19 age-group. For the precise procedures employed by Jain and Adlakha the reader is referred to their article. But for reasons such as those given above it appears that quite different results can be obtained regarding both the level and magnitude of changes of Cm between 1971/72 and 1978/79.

[15]For more on this regional dimension see for example Panel report (forthcoming).

[16]See footnote 6 on page 68.

[17]Statement relating to birth rate trends in Punjab-Haryana are complicated because. as noted in footnote 6, before 1966 their data was combined under that of the old composite state of 'Punjab'. Figure 4 shows two quite sharp annual CBR reductions (a) between 1957 and 1958, and (b) between 1965 and 1966. In both instances the raw data indicates some change in the areal basis of the registration system. In the first the considerations of footnote 4 seem relevant. In 1965-66 the discontinuity may well be related to the separation of the two states.

Somewhat more informative on the issue of fertility trends are the changes in child woman ratios (CWR's) between the 1961 and 1971 censuses (see Table 5, column (i)). The greatest CWR decline is that recorded for Punjab—strongly supporting the earlier suggestions from registration data of relatively early fertility decline. A sizeable CWR fall also occurred in Kerala. And lesser reductions in Haryana and Gujarat.

Turning to consider available state-level estimates from surveys, Table 5 also summarizes P/F ratio TFR's obtained in 1962 (four states) and 1972 (column (iv)). It seems risky to interpret these in relation to those derived by intercensal procedures for 1961-71. For one thing they are based on different techniques. For another, even the P/F estimation methods employed for 1962 and 1972 differed in several respects[18]. This said, the estimates for Kerala, and to a lesser extent Maharashtra and Haryana too, are at least consistent with some measure of fertility decline prior to 1971-72. Those for Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Rajasthan and Madhya Pradesh might be taken as indicative of little if any change in total fertility. Both the size and direction of the implied TFR change in Uttar Pradesh seems unrealistic. Finally, on this basis, there is no sign of fertility decline in Punjab.

We are probably on much firmer ground when examining state fertility changes over the period 1971-81. This is because, as we have seen, there almost certainly has been some fairly significant decline in fertility at the national level over the past decade.

As a first attempt to categorize states as more or less 'progressive' as regards fertility decline we have elsewhere examined the relationship between the percentage change in a states intercensal rate of population growth between 1961-71 and 1971-81, and the Department of Family Welfare's estimates of state-level percentages of couples 'effectively protected' by family planning as of September 1979 (Dyson, 1981). This exercise showed fairly clearly that those states in which family planning appears to be performing relatively well also tend to be those states that have experienced declines (or only minor increases) in their intercensal rates of population growth over the two decades. States in which, by these criteria, recent fertility declines can be considered either probable or virtually certain include Kerala, Gujarat, Haryana, Tamil Nadu, Maharashtra, Orissa, and Punjab. In contrast particularly in Bihar, Rajasthan and Uttar Pradesh, the signs of any change are much more difficult to discern.

In order to elaborate on this picture we now compare two further sources of estimates on state-level changes in fertility over recent years. The first are unadjusted total fertility rates for 1970 and 1976 from the Sample Registration System (see Table 5, columns (v) and (vii)). The second are state-level TFR estimates obtained by the method of Jain and Adlakha (see Table 6, and also Table 5 column (viii)).

Because there is less data available at the state-level our application of the Jain/Adlakha procedure is inevitably a little more restricted that they followed for All-India. To compute Cm for 1972 we have used the age-specific marital fertility rates (ASMFR's) from the 1972 survey combined with the proportions of women reported as currently married in the 1971 census. For 1978 we utilized both the ASMFR's and the currently married distributions from the 100% sample of the 1979 survey. Lastly, to calculate values of Cc we employed the percentages of couples estimated by the Department of Family Welfare to be 'currently protected' in each state.[19] Table 6 gives the various resulting indices, and column (ix) contains the estimated percentage reductions in TFRs between 1972 and 1978. The All-India figure of 13.4% accords reasonably well with the earlier estimates based on the assumption of no change in breastfeeding (see Table 4, panel B.[20] Interestingly, some degree of decline in total fertility is indicated for *every* state, although as one might expect the implied declines for Bihar, Rajasthan and Uttar Pradesh are much more limited. The indicated decline for Punjab is perhaps smaller than might be anticipated, while the reverse is probably true for Karnataka[21]. In most states changes in contraceptive usage (Cc) are responsible for a majority of the implied reduction, although Uttar Pradesh, Punjab and Kerala are exceptions[22]. Lastly, Table 6 (column (viii)) also gives the resulting estimates of TFR for 1978 based upon the 1971/72 P/F total fertility rates (in which we put most confidence), and the present estimates of state-level TFR decline. Clearly all these figures must be viewed firmly within the context of the limitations of the assumptions and data sets that we have employed.

---

18. For details on the two sets of P/F estimates seen Dyson (1979) and Panel report (forthcoming). These two references are also relevant for an understanding of how the state intercensal estimates were derived, but see also footnote 2 on page 67.

19. In the absence of any information to the contrary, and following Jain and Adalkha, we had to assume that both Ca and Ci were constant during 1972-78. We did not make specific adjustments to the marital fertility rate for the 15 -19 age-group. Following the suggestion of Bongaarts (1978) we assumed an average use-effectiveness of 0.85 for all methods category — a figure which may be too low in the Indian context where sterilization predominates. See also the notes to Table 6. For other limitations of this approach see Jain and Adlakha (1982).

20. Our figures on the percentage decline in TFR differ slightly from those of Jain and Adlakha partly because we did not adjust marital fertility in the 15—19 age group (refer to footnotes 14 and 19 on page 70. If we derive a weighted All-India figure from column (viii) in Table 6 then a somewhat greater degree of TFR reduction (14.6%) results. This kind of discrepancy probably in part results from the inclusion in various 'All-India' data of material for other states not used in deriving our weighted average.

21. Note the aforementioned flattening of the CBR curve for Punjab in Figure 4. In Punjab the percentage of couples 'protected' rose from only 23.7 to 26.6% between 1972 and 1978, whereas the corresponding figures for Karnataka were 10.0 and 21.0%. Of course, if these figures are seriously in error, then so too are the resulting estimated magnitudes of TFR declines.

22. The comparatively low values of Cm for Kerala underline the dominant role played by changes in nuptiality in the fertility decline of this state.

Figure 5 shows that the TFR's from the SRS in 1976 tally closely indeed with our estimates for 1978[24]. But the TFR reductions estimated here (Table 6 column (vii)) do not correspond at all closely with the declines indicated by the SRS (Table 5, column (vii)). If we compare the estimated TFRs for 1971-72 and 1978 with those from the SRS at approximately the same time, then the relationship between the estimated and SRS values is somewhat tighter at the date.[25] Indeed, an examination of the statistics in Table 5 does suggest that SRS birth coverage improved in several states during the period under review.[25] This may well help explain in the lack of correspondence between SRS trends in total fertility over 1970-1976 with those estimated here for 1972-78.

However, in at least one important respect changes in state SRS fertility statistics do correspond with what other indices bearing on fertility changes would imply. It might reasonably be expected that states where contraception was most widespread would also tend to have experienced relatively greater changes in the age *pattern* of fertility; specifically such states might be expected to have undergone greater reductions in the proportion of the age-specific fertility distribution pertaining to older women. Figure 6 suggests that such has indeed been the case.[26]

Summary and Discussion

We begin this section by summarizing the various indications as to fertility trends. Our best estimates for All-India for the 1951-61 decade are a crude birth rate of about 45 per thousand, and a total fertility rate slightly in excess of six live births per woman. For the 1961-71 decade marginally lower fertility is indicated: a CBR in the region of 41-42 and a corresponding TFR slightly below six. Hence the evidence suggests that the percentage decline in the crude birth rate between the two decades was somewhat greater than that in the TFR. And in this connection an examination of census data shows a decline in the percentage of women of childbearing age in the total population between 1951 and 1971.[27]

Support for the idea that any decline in the *average* decadal birth rate between 1951-61 and 1961-71 was only minor is also forthcoming from pooled crude birth rates from states with better vital registration data (Figure 1). Lastly, as noted above, application of Zaba's method to the 1972 fertility survey data for All-India produces no sign of age-specific fertility change. And this finding is also consistent with marginal and/or slow change in All-India total fertility prior to that time.

Coming to the most recent decade, there is a fair measure of agreement among analysts of the 1972 survey data that All-India total fertility was around 5.8 live births, with an attendant crude birth rate of about 40 per thousand. On this basis the SRS birth rate in 1971-72 was in the vicinity of 8-10% deficient. Analysis of the 1979 survey data indicates that age-specific fertility rates had indeed declined significantly by 1978 (Figure 2). The present analysis of the 1979 survey gives a TFR of around 4.9-5.0 with crude birth rates of 35.0-35.5. Some slight suggestion of improved SRS birth coverage emerges. Our results compare favourably with those obtained by Jain and Adlakha. Their estimates of TFR for 1978 range from 4.90 to 5.24. But they prefer the lower figure (i.e. that derived assuming no change in breastfeeding). And they too think that SRS birth coverage may well have improved slightly over the period.

On balance then we consider that between 1971-72 and 1978 the All-India crude birth rate probably fell by about 10-12%. The corresponding figure (unadjusted) from the SRS is 10%. In our view the percentage reduction in total fertility was marginally greater—somewhere in the region of 14-16%. Most of the difference can almost certainly be accounted for by age-structural change.[28] In any event—minor perturbations apart—the SRS crude birth rate trend for the decade-shown in Figure 1-is unlikely to be far wrong. Also in Figure 1, the vital registration time-series indicates a 17% CBR reduction for the constituent five states between 1971-72 and 1978. Interestingly, the corresponding percentage reduction from the SRS is 15%.[29] Lastly, if SRS birth rate coverage did improve to the extent suggested above then the average crude birth rate for the decade would be much closer to 37 than to 39.[30]

Turning to the state-level, we certainly have to recognize a probable wide diversity of birth rate trends.

---

[23] For purposes of comparison we use SRS rates for 1970 and 1976. Although the correspondence with the period 1972-78 is only approximate, the SRS TFR's for 1976 are the latest to which we have access, and on balance the effect of any displacement involved in the comparisons ought not to be very great.

[24] We are making two comparisons in Table 5; firstly between columns (iv) and (v), and secondly between columns (vi) and (viii). The respective correlation coefficients in these comparisons are 0.91 and 0.96.

[25] Perhaps the most obvious from several candidates for coverage-level improvement are Tamil Nadu and Haryana. However the reverse may be indicated for other states (e.g. Rajasthan). In the context of such a general coverage-level improvement, note from Figure 1 that 1976 SRS birth rates are indeed well above 'trend'. Perhaps 1976 was a year of increased vigilance in the system.

[26] We recognize of course that the relationship examined in Figure 6 is not a necessary one.

[27] The percentage of women 15–49 to the total population declined from 23.85% in 1951 to 22.32% in 1971. If anything we feel that the present estimates for 1961-71 are very slight underestimates relative to those for 1951-61.

[28] According to the Registrar General the percentage of India's population aged 15—59 grew by 7% between the 1971 Census and the 1979 survey, from 52.0 to 55.9% (draft of panel report).

[29] The states concerned are all relatively 'advanced'. We would thus expect their CBR decline to be above average. However we do not contend that the detailed movements of vital registration CBRs over time are exact although we do hold that much can be learnt from them.

[30] On the basis of a linear improvement in coverage level between 1971-72 and 1978 the decadal CBR would be 36.97. For other arguments that 39 is too high an average figure for the decade see Dyson (1981).

A tentative first attempt at a rough grouping of states is as follows: first, in the cases of a few smaller states —most probably Punjab and Kerala, but Delhi and Haryana too—there exists a *prima facie* case that crude birth rates, at least, may have begun what proved to be a fairly continuous decline from approximately the late 1950's.[31] The CWR falls recorded between 1961 and 1971 for these states (and less certainly perhaps, Gujarat) may well be indicative of declines in age-specific fertility in the latter 1960's. However, as noted previously, any such changes were not sufficiently pronounced to be readily detectable for 1971-72 at the All-India level. Our second group of states is more difficult to specify. But it contains at least the three major populations which seem to share the overall CBR trend depicted in Figure 1, i.e. Maharashtra, Gujarat and Tamil Nadu. Figure 3 details this time-pattern for the composite state of Bombay, and also indicates that it may have been experienced in other areas of the developing world as well. We feel that until, say, around 1970, this pattern of change in crude birth rates probably owes much more to changes in age-structure, (and relatedly changes consequent upon rapid mortality decline) than to any changes in age-specific fertility rates.[32] This said, Table 6 indicates that between 1971-72 and 1978 each of these three states probably experienced a fairly significant reduction in it's level of total fertility.

Data on trends for the third group of states is more limited. Hence grouping them together here is more a matter of convenience than a sign of real commonality of birth rate trends. Nevertheless both Table 6 and Figure 6 indicate that Karnataka, Orissa and Andhra Pradesh have experienced a reasonable measure of fertility decline during the last decade.[33] Finally, the fourth broad grouping of states we can identify are those in which comparatively limited progress towards fertility reduction seems to have been achieved so far. This group consists primarily of Bihar, Rajasthan and Uttar Pradesh.

But in conclusion we can unequivocally say that India as a whole experienced a significant decline in it's fertility level and birth rate during the 1970s—a decline in which to some degree every major state in the country appears to have shared. The current national crude birth rate cannot be much in excess of 35 per thousand. And whereas just a few years ago an examination of state-level total fertility rates was dominated by fives and sixes, in the late 1970's, as Table 5 shows, fours, and even three's are more the order of the day.

Acknowledgements

Thanks are due to Mr P. Padmanabha, Registrar General and Census Commissioner for making an early published copy of the 1979 survey Fertility Report (India, 1982) available to us. Mike Murphy kindly assisted with the cross-spectral analysis. And the ideas on the possible similarities of crude birth rate trends have arisen from discussions with Allen Hill.

Table 1 : Selected All-India Fertility Estimates, 1951-61 and 1961-71

Source	Period	Crude birth rate	Total fertility rate
Visaria	1951-61	44.9	6.09
Coale and Demeny	1951-61	45.0	6.36
Adlakha and Kirk	1961-71	40.4—42.0	5.72 –5.92
Rele and Sinha	1961-71	42.0	..

NOTES : Source references are Visaria (1969); Coale and Demeny (U.N. 1967); Adlakha and Kirk (1974) and Rele and Sinha (1973)

Table 2 : Intercensal Fertility Estimates based upon estimated and assumed levels of q2.

Period	q2	Reverse	Forward	Reverse	Forward
1951-61	0.266	46.8	46.7	6.28	6.26
	0.251	45.8	45.8	6.15	6.15
	0.236	44.8	44.9	6.03	6.04
1961-71	0.184	41.3	40.6	5.83	5.72

[31]NOTES : The q2 values of 0.266 and 0.251 are assumed, not estimated (see text). Further details pertaining to the 196 -71 intercensal estimates can be found in the Panel report (forthcoming). The indirect standardization used here employed the age specific distribution indicated by the 1972 All-India Fertility Survey Report (India, 1976), adjusted for six months displacement.

[32] We are only grouping these states roughly according to trends. Mechanisms accounting for trends may differ. However, the possibility of such early declines should not surprise. Probably the earliest modern fertility decline in the subcontinent occurred among the Indian Tamil population of Sri Lanka, and preceded by several years that experienced by the island's other inhabitants (see Langford, 1982).

[33] The notion that *crude* birth rate trends in parts of India may be similar to those experienced in some populations elsewhere is obviously forwarded tentatively and as something to be further explored. But, for the record, a cross-spectral analysis has been performed on the two sets of data shown in Figure 3, de-trended by differencing. This analysis showed a fairly high coherence (around 0.5 for periods of about 8 years and over). For periods under 4 years the coherence was everywhere small (below 0.1). Although the sample sizes involved are small (number of years), on balance the evidence would tend to confirm that there is a relationship between CBR changes in Bombay state and Egypt a relationship which is *not* simply due to a common linear trend. The lack of relationship at high frequencies (i.e. at short periods) could well be due to measurement errors in the two series involving delayed registration.

On Karnataka see footnote 21 above. A district-level analysis for Orissa shows clearly that those districts in which family planning acceptance is high are those that have experienced the greatest reductions in their intercensal rates of population growth.

See Table 6, Figure 6, and also Dyson (1981). Madhya Pradesh can only less certainly be grouped with these three states.

Table 3 : Summary of Application of Zaba's Ratio Method to the 1979 Survey Data

Age Group of Women	Mean Parities	Parity Graph Points (P)	Cumulative Current Fertility	Current Fertility Graph Points (F)	Model Mean Parities	TFR Estimates Columns (ii)/(vi)
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
15—19	0.1215	—2.0363	0.3230	—1.7387	0.0235	5.17
20—24	1.0019	—1.3025	1.4675	—0.8733	.02154	4.65
25—29	2.4266	—0.4617	2.6205	0.0179	0.4938	4.91
30—34	3.6281	0.4121	3.4270	0.9697	0.7322	5.95
35—39	4.4820	1.7348	3.9585	2.4000	0.8961	5.00
40—44	4.8898	3.4093	4.1949	3.6213	0.9802	5.00
45—49	5.0140	..	4.3025	..	0.9991	5.02

NOTES : The mean parity and cumulative current fertility data used here was taken from Panel report (forthcoming). In the case of both parity and current fertility data the graph points are based on transformations of the ratios (i) of consecutive values by age group The graph points are then equal to $-\log(-\log\phi)-\phi-'\phi$. For details of the transformations employed, the adjustment factors ($\phi'-\phi t$). required, and the model fertility distribution used see Zaba (1981). The estimated values of $\propto$ and $\propto$ here are $\propto$—0.0653 and β=1 1647 (these values were obtained by group average procedure on the basis of the first 5 P points). Of course, the summation value of 4.3025 in column (iv) is the estimated level of total fertility based solely on data on current fertility. As we remark in the text, this value is almost certainly much too low as an estimate of the TFR around 1978-79.

Table 4 : Summary of changes in the proximate fertility indices and total fertility according to Jain and Adlakha

Panel A

	1972 (i)	1978 (ii)	(Ratio of (ii)(i) (iii)
Index of noncontraception : Cc	0.864	0.777	0.899
Index of proportions married : Cm			
Assumption 1	0.799	0.769	0.962
Assumption 2	0.843	0.800	0.949
Index of lactational infecundability: Ci			
No change	..	..	1.000
2 month breastfeeding decline	0.592	0.625	1.055

Panel B

Estimated ratios of total fertility rates 1978/72	Implied % decline in TFR
0.899 × 0.962 × 1.000 = 0.865	13.5
0.899 × 0.962 × 1.055 = 0.912	8.8
0.899 × 0.949 × 1.000 = 0.853	14.7
0 899 × 0.949 × 1.055 = 0.900	10.0

NOTES: Source for statistics, Jain and Adlakha (1982). Recall that Ca is assumed constant.

Table 5 : Selected State Level Fertility Measures

Region/State	% change in CWR, 1961-71[1]	1961/62 P/F TFR estimates[2]	Intercensal 1961-71 TFR[3]	1971/72 P/F TFR estimates[4]	1970 SRS TFR[5]	1976 SRS TFR[5]	Column (vi)/ Column (v)[6]	1978 TFR Present Estimates[7]	Change in Percentage of SRS, ASFR Distribution-30 1970-73 to 1974-77[8]
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
e South									
Kerala	−14	5.67	4.71	4.49	4.10	3.36	0.820	3.39	−3.6
Tamil Nadu	−2	4.52	4.73	4.58	3.80	3.79	0.997	3.67	−2.9
Andhra Pradesh	+2	4.67	5.23	4.80	4.85	4.39	0.905	4.00	−2.6
Karnataka	−1	N.A.	5.59	5.50	4.40	3.75	0.852	4.09	−2.0
Maharashtra	−1	N.A.	5.43	4.92	4.40	3.91	0.889	3.97	−5.1
e North									
Gujarat	−7	N.A.	5.90	5.97	5.80	5.15	0.888	4.76	−4.1
Rajasthan	+1	N.A.	6.34	6.38	6.26	5.43	0.867	5.79	−1.3
Uttar Pradesh	+4	N.A.	6.37	6.89	6.80	5.92	0.871	6.13	−1.3
Madhya Pradesh	+6	N.A.	6.39	6.16	5.60	5.83	1.041	n.a.	0.0
Punjab	−16	N.A.	5.40	5.57	5.46	4.77	0.874	4.69	−4.0
Haryana	−7	N.A.	6.99	6.64	5.78	5.15	0.891	5.10	−5.8
he East									
Bihar	−3	N.A.	5.64	(4.75)	N.A.	N.A.	..	N.A.	N.A.
West Bengal	+1	N.A.	6.00	N.A.	N.A.	N.A.	..	N.A.	N.A.
Orissa	+8	4.64	5.83	5.54	5.21	4.69	0.900	4.53	−2.5
Assam	+3	N.A.	7.11	6.35	5.60	4.47	0.798	N.A.	−1.7
All India	−2	N.A.	5.78	5.80	..	..	..	5.02	..

[1]Source : Dyson (1979). Given probable early age mortality decline during 1961-71, the All-India CWR decline may imply me measure of fertility decline during the late 1960's.

[2]Source : Dyson (1979). These estimates are supportive of relatively low total fertility in South India as far back as 1961/62.

[3]Source : Panel report (forthcoming). Figures are the mean of TFRs obtained by indirect standardization from forward and verse projection procedures; see also footnote 2 and the notes to Table 2.

[4]Source : Panel report (forthcoming). The figure for Bihar is in brackets because it is believed to be too low. For certain states pecially those (e.g. Kerala and Punjab) where age-specific fertility was probably declining by 1971-72 the TFR's have been further ad-ted after the application of P/F. For slightly different state-level P/F estimates from the same data see Dyson (1979).

[5]Figures are based on tabulations kindly provided to the India panel by Mr. P. Padmanabha, Registrar General and Census Commi-oner. In column (v) the TFR for Kerala relates to 1971, and that for Rajasthan to 1972. In column (vi) the TFR for Rajasthan is t for 1975 because that for 1976 is obviously in error. In column (ix) most of the figures relate to the periods specified, but a few based on slightly different years according to data availability. To illustrate what the figures in column (ix) mean in Andhra Pradesh 1970-73, 34.2 % of the age-specific fertility distribution pertained to women aged 30 and over. But in 1974-77 the corresponding figure s only 31.6 % i.e. there was a decline over the period of 2.6%. Such a change in the shape of the fertility distribution is likely to be dicative of a decline in fertility concentrated among older women.

[6]Although based on slightly different years, the figures in this column should broadly correspond to the statistics in column (vii) Table 6. See text for some suggestions as to why they do not.

[7]These are obtained by adjusting the TFRs in column (iv) of this Table by the factors presented in column (vii) of Table 6.

Table 6 : Summary of State-Level changes in the Proximate fertility indices and total fertility

Region/State	1972	Cm 1978	1978/72	1972	Cc 1978	1978/72	column (iii) × column (vii)	Implied decline in TFR
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
The South								
Kerala	0 679	0.572	0.843	0.813	0.729	0.897	0.756	24.4
Tamil Nadu	0.759	0.694	0.914	0.839	0.736	0.877	0.802	19.8
Andhra Pradesh	0.865	0.815	0.943	0.856	0.757	0.884	0.834	16.6
Karnataka	0.821	0.715	0.871	0.900	0.769	0.854	0.744	25.6
Maharashtra	0.857	0.824	0.961	0.807	0.678	0.840	0.807	19.3
The North								
Gujarat	0.845	0.785	0.928	0.818	0.703	0.859	0.798	20.2
Rajasthan	0.928	0.904	0.974	0.940	0.877	0 933	0.909	9.1
Uttar Pradesh	0.922	0.865	0.938	0.935	0.887	0.949	0.890	11.0
Madhya Pradesh	0.914	n.a.	..	0.849	0.798	0.940	..	..
Punjab	0.808	0.707	0.875	0.762	0.733	0.962	0.842	15.8
Haryana	0.914	0.815	0.892	0.811	0.699	0.862	0.769	23.1
The East								
Bihar	0.915	0.871	0.952	0.937	0.888	0.948	0.902	9.8
West Bengal	n.a.	0.698	..	0.903	0.807	0.894	..	..
Orissa	0.859	0.760	0.885	0.830	0.767	0.925	0.817	18.3
All-India	0.856	0.819	0.956	0.868	0.786	0.905	0.866	13.4

NOTES : Age-specific marital fertility rates (ASMFR's) for 1972 and 1978 are based upon figures in India (1976) and India (1982) respectively. In combining urban and rural ASMFR's to produce 'All-state' figures for 1972 we used the appropriate age-specific data on proportions currently married, by urban/rural residence, available in India (1977). For 1978 urban/rural weights were based on female urban/rural figures in India (1981). To calculate state-specific values of Cc for 1972 we used the official estimates of current-users as of March, 1972 reproduced in Visaria and Jain (1976). For the value of Cc for March, 1978 we interpolated between the 1972 figures and those on current users as of September 1979 available in India (1979). See also footnote 19.

References

1. Adlakha, A., 'Vital Rates in India, 1951-61' paper presented to a meeting of the India Panel, Committee on Population and Demography, United States National Academy of Sciences, New Delhi, 1979.

2. Adlakha, A. and D. Kirk, 'Vital Rates in India 1961-71' in *Population Studies* Vol. 28, No. 3. 1974.

3. Bongaarts, J., 'A framework for analyzing the proximate determinants of fertility', in *Population and Development Review*, Vol. 4, No. 1, 1978.

4. Brass, W., *Methods of Estimating Fertility and Mortality from Limited and Defective Data*, An Occasional publication of the Laboratories For Population Statistics, Chapel Hill, North Carolina, 1975.

5. Carr-Saunders, A.M., *World Population, Past Growth and Present Trends*, Oxford University Press, 1936.

6. Dyson, T., A Working Paper on Fertility and Mortality Estimates for the states of India, paper presented to a meeting of the India Panel, Committee on Population and Demography, United States National Academy of Sciences, New Delhi, 1979.

7. Dyson, T., 'The Preliminary Demography of the 1981 Census' in *Economic and Political Weekly*, Vol. XVI, No. 33. 1981.

8. India *Fertility Differentials in India*, 1972, Vital Statistics Division, Office of the Registrar General, New Delhi, 1976.

9. India, *Social and Cultural Tables*, Census of India, 1971, Series 1, Part II-C(ii), Office of the Registrar General, New Delhi, 1977.

10. India, *Monthly Bulletin on Family Welfare Statistics*, published by the Evaluation and Intelligence Division of the Department of Family Welfare, Government of India, New Delhi, 1979.

11. India, *Evaluation of Birth and Death Registration in India*, 1961-71, Office of the Registrar General, Occasional Paper No. 1. New Delhi, 1980.

12. India, *Sample Registration Bulletin*, Vol. XV, No. 2. Office of the Registrar General, New Delhi, 1981 (a).

13. India, *Provisional Population Totals*, Census of India, 1971, Series 1, Paper 1 of 1981, Office of the Registrar General, New Delhi, 1981 (b).

14. India, *Levels, Trends and Differentials in Fertility*, 1979. Office of the Registrar General, New Delhi, 1982.

15. Jain, A. and A. Adlakha, 'Preliminary Estimates of Fertility Decline in India during the 1970's', in *Population and Development Review*, Vol. 8, No. 3. 1982.

16. Langford, C.M., *The Fertility of Tamil Estate Workers in Sri Lanka*, Scientific Report No. 31 of the World Fertility Survey, London, 1982.

17. Panel on India, *Vital Rates in India*, 1961-81, Committee on Population and Demography, United States National Academy of Sciences, Washington, D.C. Forthcoming.

18. Rele, J.R., and U.P. Sinha, 'Birth and death rates in India during 1961-70—a Census analysis', in Demography India, Vol. 2. No. 2. 1973.

19. United Nations, Manual IV, *Methods of Estimatting Basic Demographic Measures from Incomplete Data*, New York, 1967.

20. Visaria, P. 'Mortality and Fertility in India, 1951-61', in *Milbank Memorial Fund Quarterly*, Vol. 47, No. 1. 1969.

21. Visaria, P., and A.K. Jain, *India*, a Country Profile, a publication of the Population Council, New York, 1976.

22. Visaria, P and L. Visaria, 'Indian Population Scene after 1981 Census', in *Economic and Political Weekly*, Special Number, 1981, Vol. XVI, Nos. 44, 45 and 46. 1981.

23. Wyon. J, and Gordon J.B., *The Khanna Study: Population Problems in the Rural Punjab*, Harvard University Press, 1971.

24. Zaba, B., Use of the Relational Gompertz Model in Analyzing Fertility Data Collected in Retrospective Surveys, Centre for Population Studies, Working Paper No. 8. London School of Hygiene and Tropical Medicine, 1981.

Figure 1 : Crude birth rate time series for India : Five states (Vital Registration) and All-India (SRS)

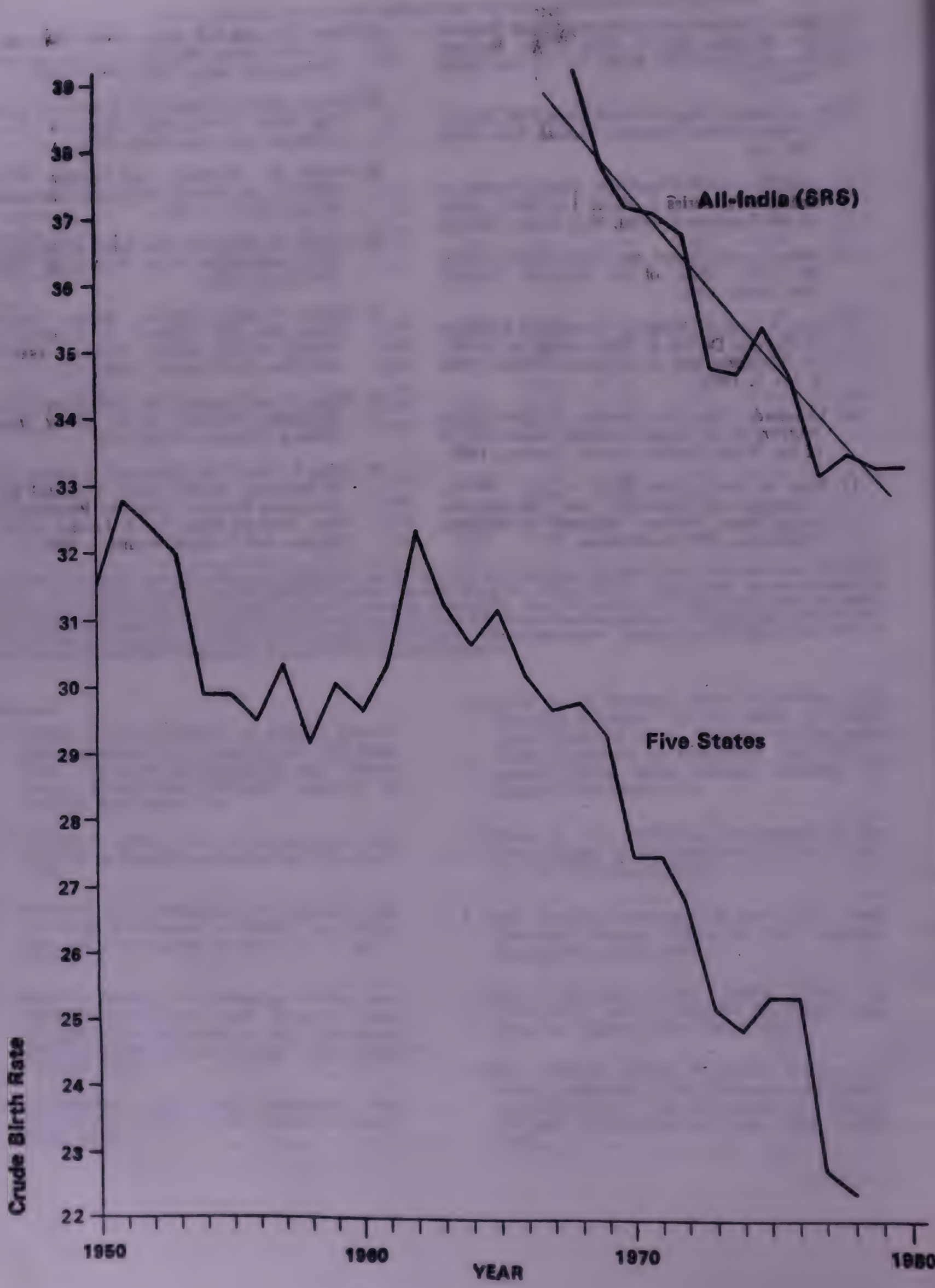


Figure 3 : Registered crude birth rates in Bombay state and Egypt

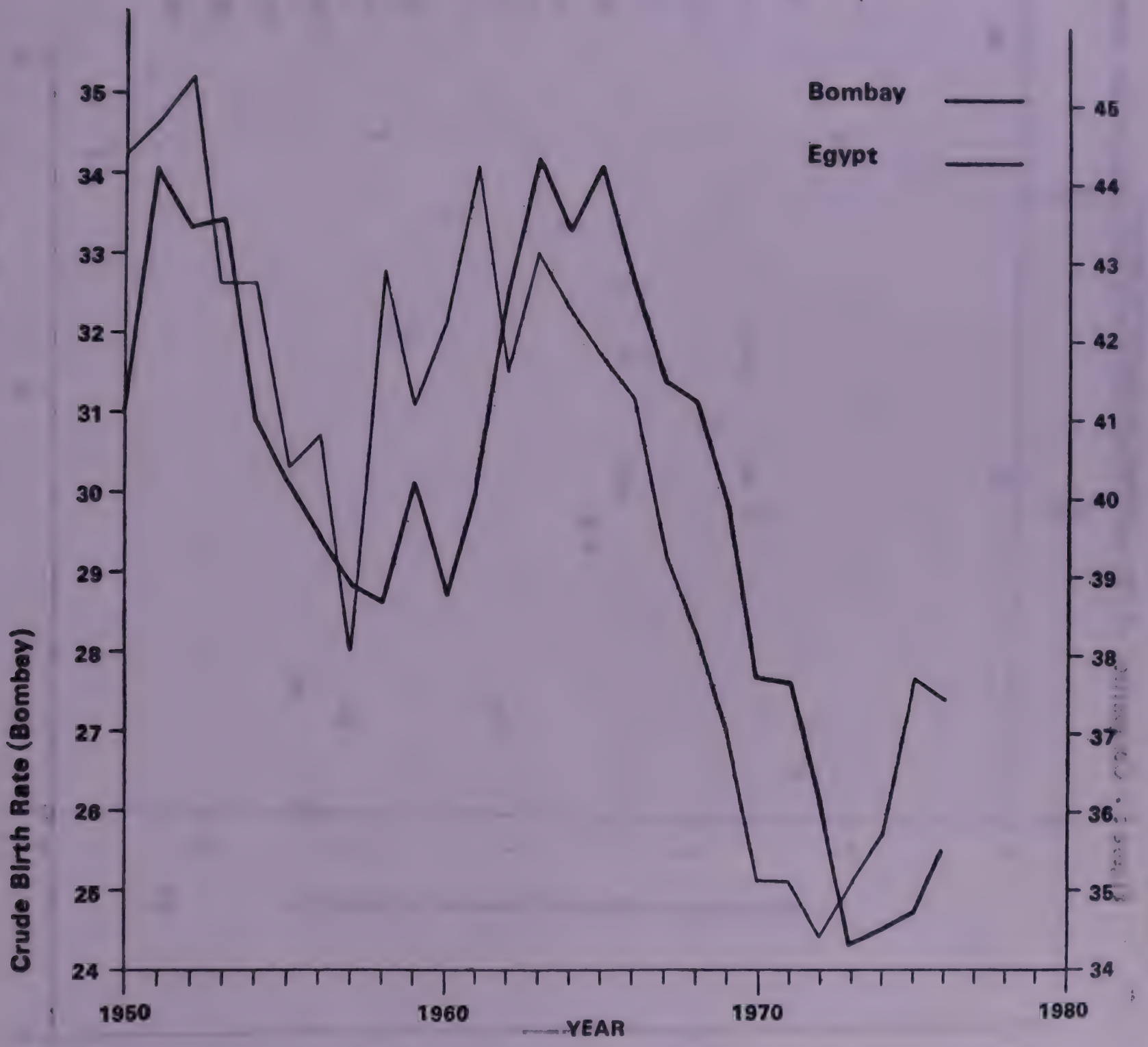


Figure 5 : Comparison of SRS and present estimates of state total Fertility Rates

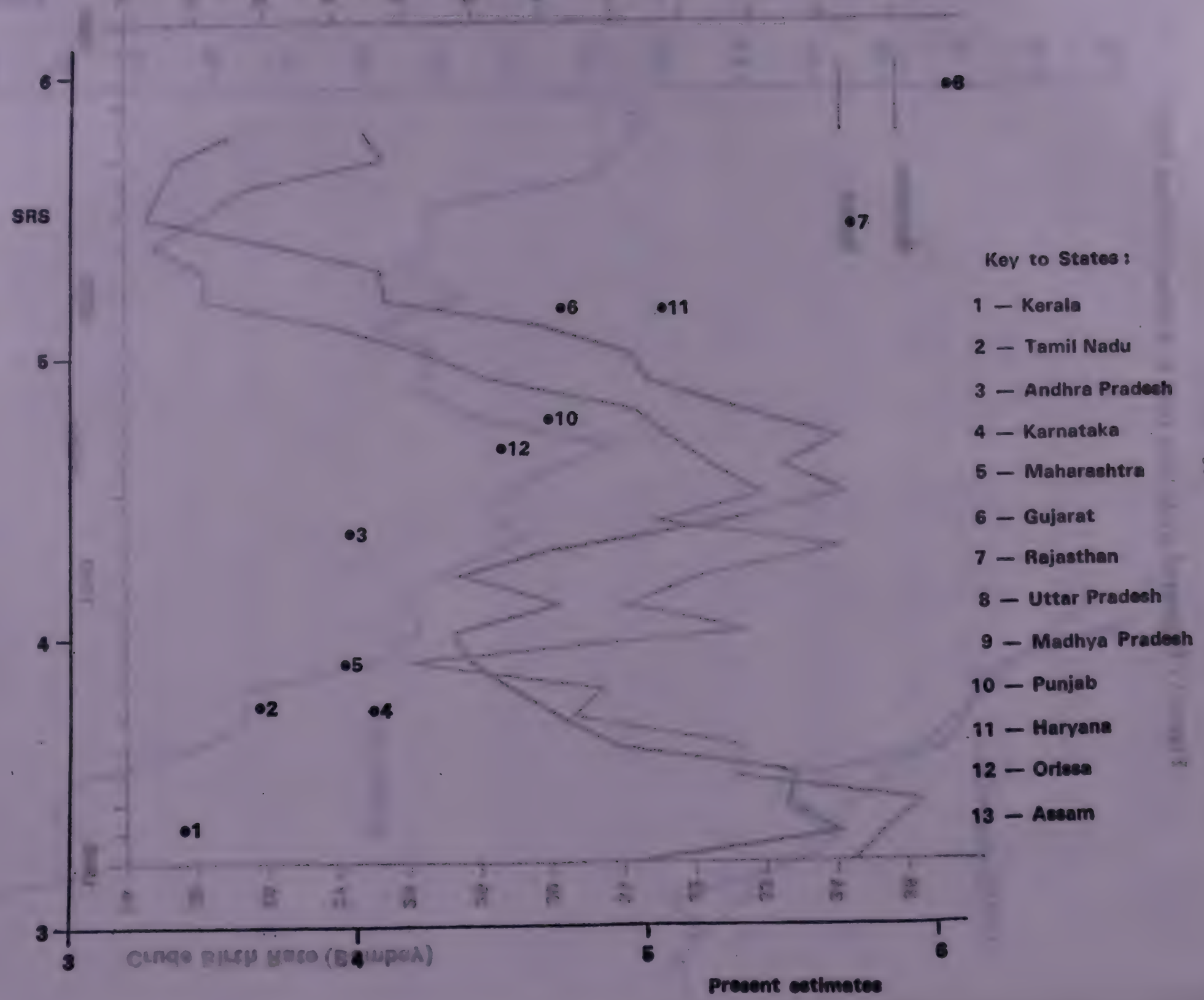
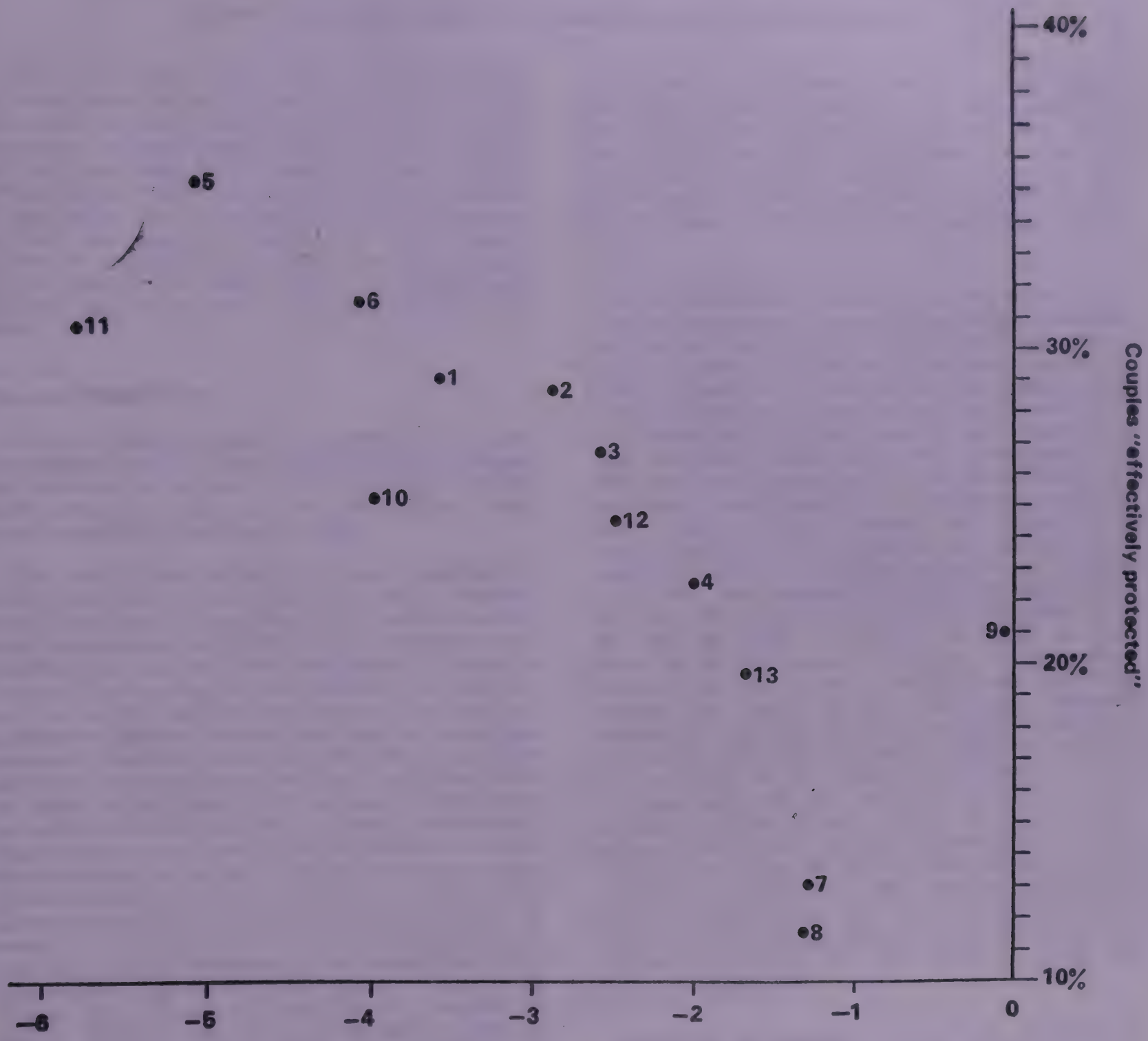


Figure 6 : Change in the age pattern of Fertility, compared with a measure of Family Planning Performance, by state



FERTILITY ESTIMATES FOR SRI LANKA DERIVED FROM THE 1981 CENSUS

KANTHI RATNAYAKE, ROBERT D. RETHERFORD, AND S. SIVASUBRAMANIAM

This report presents results from an application of the own-children method of fertility estimation to the 1981 census of Sri Lanka. The application provides estimates of trends in total fertility rates and age-specific birth rates both for all women and for currently married women for the period 1966-80. The estimates of age-specific fertility for currently married women are used additionally to compute the Coale-Trussell m index of marital fertility control. Fertility estimates are obtained for the whole country, geographic subdivisions, and a number of socioeconomic characteristics.

Data and Methodology

The own-children method was applied to a 10 percent sample from Sri Lanka's 1981 census. This sample, consisting of approximately 1.4 million individuals, was created by selecting systematically every tenth census block from the full count.

The own-children method has been described in earlier publications[1] and needs only to be recapitulated briefly here. The method is a census or survey-based reverse-survival technique for estimating age-specific birth rates for years previous to a census or household survey. Enumerated children are first matched to mothers within households on the basis of answers to questions on age, sex, marital status, and relation to head of household. (Number of children ever born and number of children still living were not asked in Sri Lanka's 1981 census and could not be used for matching in the present application). These matched (i.e., own) children, classified by own age and mother's age, are reverse-survived to estimate numbers of births by age of mother in previous years. Reverse-survival is also used to estimate numbers of women by age in previous years. After adjustments are made for incorrect enumeration and unmatched (non-own) children, age-specific birth rates are calculated by dividing the number of births by the number of women. Estimates are computed for each of the 15 years or groups of years before the census. Estimates are not computed further back than 15 years, because births must then be based on children aged 15 or more at enumeration, a large proportion of whom do not reside in the same household as their mother and hence cannot be matched. All calculations are done initially by single years of age and time. Estimates for groups of ages or calendar years are obtained by appropriately aggregating numerators and denominators of single-year rates and then dividing the aggregated numerator by the aggregated denominator.

No adjustments for incorrect enumeration (age-selective undercount or age misreporting) are made here, because the estimates of misenumeration necessary to compute adjustment factors were not available. It should be noted, however, that if undercount is proportionately the same for each sex at each age, the own-children fertility estimates are unaffected, since estimated numerators and denominators of birth rates are then subject to the same multiplicative errors, which cancel. Age misreporting is potentially a more serious problem. Age misreporting (mainly age heaping of children on certain digits) manifests itself in the fertility estimates by a jagged trend when these estimates are plotted by single calendar years. Fortunately, the quality of age reporting in the 1981 Sri Lanka census is rather good, as illustrated by the age pyramid in Figure 1; and we shall see later that the estimated fertility trends are rather smooth. The quality of age reporting improved substantially between the 1971 and 1981 censuses of Sri Lanka, with Myers' blended index of digit preference, based on ages 10-69, falling from 7.5 to 3.9 for males and from 10.1 to 4.8 for females. (A value of zero indicates no age heaping at all.)[2] The age pyramid, the rather smooth estimated trend lines, and the low values of Myers' index suggest that the absence of adjustments for incorrect enumeration and age misreporting does not introduce significant error in the fertility estimates (with the minor exception of estimates for the 15-19 and 45-49 age groups, discussed later).

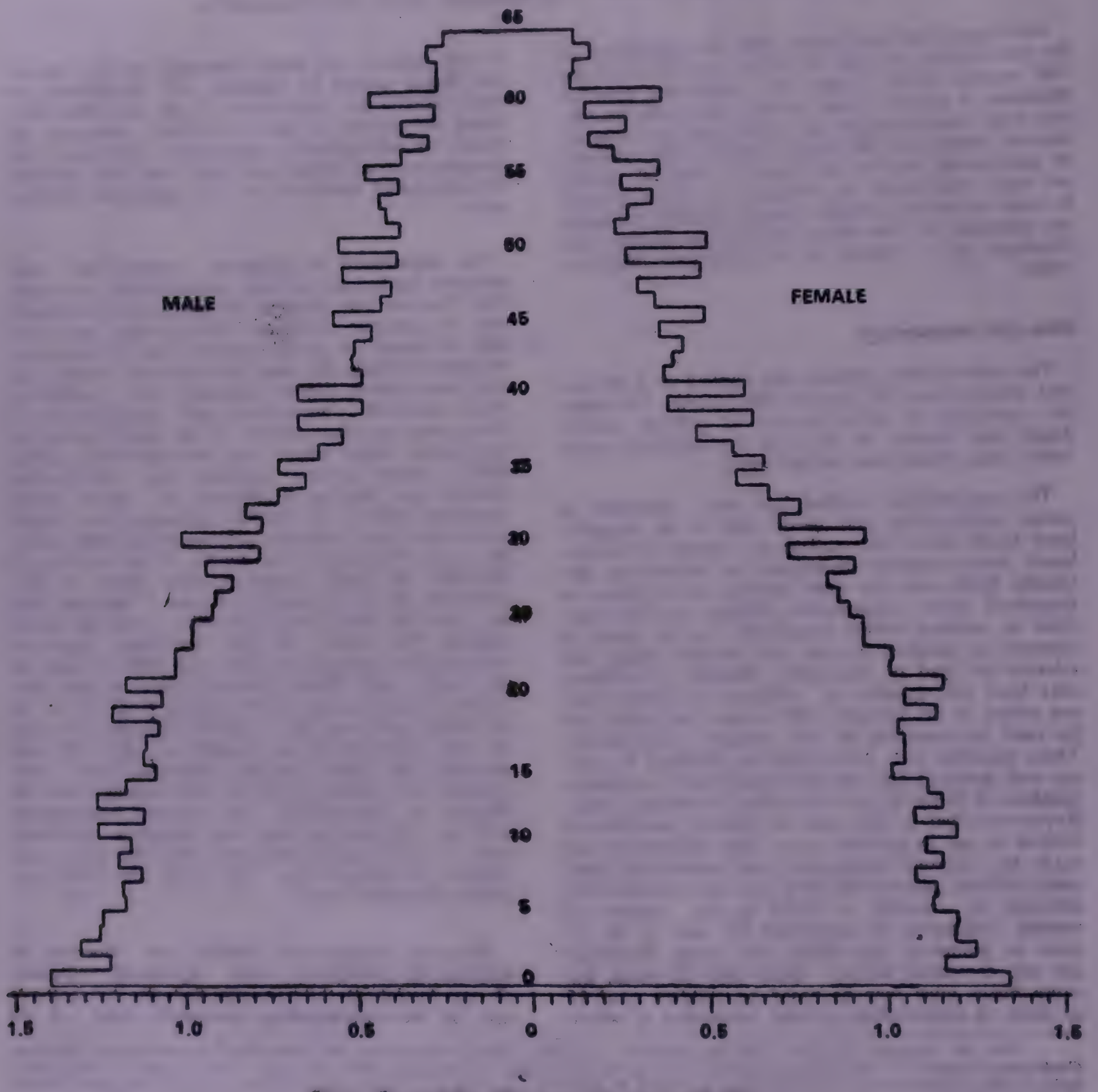
Non-own (unmatched) children are allocated to mothers by multiplying each age-specific category of own (matched) children, specified also by mother's age, by the corresponding age-specific ratio of all

[1] *See*, for example, L.J. Cho, "The Own-Children Approach to Fertility Estimation: An Elaboration," in *International Population Conference, Liege* 1973 (Liege: International Union for the Scientific Study of Population, 1973) vol. 2, pp. 263-278; and R.D. Retherford and L.J. Cho, "Age-Parity-Specific Birth Rates and Birth Probabilities from Census or Survey Data on Own Children", *Population Studies* 32 (1978): 567-581.

[2] Methodology for computing Myers' index can be found in H.S. Shryock and J.S. Siegal, *The Methods and Materials of Demography* (Washington, D.C.: Government Printing Office, 1973), vol. 1, pp. 206-208. The values of the index for 1971 were computed from single-year age distributions in Sri Lanka Department of Census and Statistics, *Census of Population* 1971, *Vol. II: All Island Tables* (Colombo: Department of Census and Statistics, 1975), Table 6, pp. 10-11. The values of the index for 1981, based on the 10 per cent sample, were computed from single-year age distributions given in Sri Lanka Department of Census and Statistics, *Census of Population and Housing, Sri Lanka*, 1981, Preliminary Release No. 2 (Colombo: Department of Census and Statistics), Table 8, p. 20. One of the reasons why age reporting improved between the 1971 and 1981 censuses was that in the 1971 census a simple question on age was asked, whereas in the 1981 census the interviewer made use of an age identification card to obtain age from responses to a question on month and year of birth a precise translation from birth date to age through use of the card was possible because the census was conducted during a single evening between 6 p.m. and midnight.

12—5 RGI/ND/84

Figure 1 : Age pyramid by single years of age, based on the 1981 census of Sri Lanka (in percent)



Source : Computed from 1981 census 10 percent sample tape.

children to own children. Thus own children of a given age are adjusted upward by the same factor regardless of mother's age, thereby introducing some error into the fertility estimates since the proportionate distribution of non-own children by age of mother generally differs somewhat from the proportionate distribution of own children by age of mother. Since older women are usually in more stable household situations than younger women, the nature of this error is usually erroneously reallocate, on net, a certain proportion of non-own children from younger mothers to older mothers. This error usually has little effect on the total fertility rate, but it sometimes produces an age pattern of fertility that is too low at the younger ages and too high at the older ages. The error is minor if the adjustment factors for non-own children are close to unity, but in Sri Lanka the adjustment factors depart significantly from unity. For the whole country, for example, the non-own factors are moderately high, ranging from 1.13 at age 0 to 1.26 at age 14. In between, the non-own factors increase fairly smoothly with age, which is expected since an older child is usually more likely to be living in another household or to have a deceased mother than a younger child. Why the non-own factors are this high is not clear. They are high enough that the derived age patterns of fertility should be viewed with some caution, although we shall see later, on the basis of limited comparisons, that estimates of both total fertility and age-specific fertility usually agree quite well with estimates from other sources. Thus the moderately high non-own factors in the 1981 census do not seem to introduce significant error in the own-children fertility estimates.

Reverse-survival requires life tables by sex, which were obtained from published sources for the time period 1970-72.[3] The published life tables, abridged in 5-year age groups, were interpolated to single years of age in order to compute reverse-survival ratios by single years of age.[4] According to these life tables, mortality was quite low in Sri Lanka during the estimation period, with life expectancies of 64 and 67 years for males and females respectively.

At such low levels of mortality, reverse-survival factors are close to one, and the own-children fertility estimates are rather insensitive to mortality estimation errors and mortality differentials.[5] Therefore, we used the same life tables by sex for all calendar years and for all geographic subdivisions and socioeconomic categories; this was necessary in any case, because life tables cross-classified by these variables were not available.

Once the own-children estimates of age-specific birth rates and total fertility rates for all women were calculated, estimates of age-specific birth rates for currently married women were obtained in the following way: First, age-specific proportions currently married in 5-year age groups were obtained from the 1971 and 1981 censuses (10 per cent samples on tape) and linearly interpolated or extrapolated to get age-specific proportions currently married in 5-year age groups for each year between 1966 and 1980. In this way we obtained for each geographic unit and socioeconomic category an array of age-specific proportions currently married, with age in 5-year age groups along one dimension, and time in single calendar years (or midpoints of time periods) along the other dimension. From the original own-children analysis, we had corresponding arrays of age-specific birth rates for all women. We obtained corresponding arrays of age-specific birth rates for currently married women by dividing, term by term, the array of age-specific birth rates for all women by the array of age-specific proportions currently married. This calculation presumes that all births occur within marriage, an assumption that introduces negligible error since there is very little illegitimacy in Sri Lanka. We also calculated the singulate mean age at marriage, based on proportions single in 5-year age groups between ages 10 and 50, as a summary index of nuptiality.[6] All these interpolations, extrapolations, and estimates take into account that the 1981 census was taken in March. Thus the census date is considered 1981.2, so that a particular calendar year in the own-children tabulations, say 1979, refers to the period 1979.2-1980.2. Interpolated values thus refer to midpoints of these periods; i.e., to 1966.7, 1967.7 ..., 1980.7.

Marital total fertility rates were obtained by adding birth rates in 5-year age groups between ages 20 and 50 and multiplying the sum by 5. Ages 15-19 were omitted from this calculation, because the MTFR summed over all reproductive ages, including 15-19, is not a very satisfactory fertility measure. It is not a good measure because it weights the birth rate at ages 15-19, which in Sri Lanka is high but based on relatively few married women because of late marriage, in the same way that it weights birth rates in older age groups. (As we shall see later, only about 10 per cent of women aged 15-19 are currently married). Moreover, fertility trends and differentials at ages 15-19 are prone to estimation errors, and they often differ substantially from trends and differentials at other ages. Thus a measure that accords undue weight to fertility at 15-19 can produce a distorted view of overall marital fertility trends and differentials. In this paper we deal with this problem by summing rates over the age range 20-49 instead of 15-49. The various estimates of trends and differentials are then more consistent, but at the cost of some loss of information.

---

[3]Sri Lanka Department of Census and Statistics, *Life Tables 1970-72: Sri Lanka* (Colombo: Department of Census and Statistics 1978), Pp. 4-5.

[4]For methodology, based on an interpolation procedure developed by Griffith Feeney, see R.D. Retherford, "Single-Year Computational Procedures used in the Own-Children Method of Fertility Estimation," *Asian and Pacific Census Forum* 4(3) (1978) : 5-8.

[5]R.D. Retherford, Aphichat Chamratrithirong, and Anuri Wanglee, "The Impact of Alternative Mortality Assumptions on Own-Children Estimates of Fertility for Thailand," *Asian and Pacific Census Forum* 6(2) (1980): 5-8.

[6]For methodology for computing SMAM, see Shryock and Siegel, *op. cit.* in footnote 2, p. 295.

Finally, we also compute the Coale-Trussell m index of marital fertility control.[7] This index measures the deviation of the observed age pattern of marital fertility from the typical age pattern of natural marital fertility that results from deliberate family limitation. (Natural fertility is defined as fertility in the absence of deliberate family limitation). The m index depends only on the shape of the age-specific marital fertility schedule, and not at all on the level of marital fertility. In the natural fertility situation, the shape of the schedule is convex-upward throughout the reproductive age range, whereas in the family limitation situation it is concave-upward at the upper end of the range. For purposes of constructing the m index, the standard age schedule of natural fertility is obtained as the arithmetic average of ten of the schedules designated by Henry.[8] If the observed age-specific fertility schedule has the same shape as that of the standard age-specific natural fertility schedule, m=0. If the shape of the observed schedule deviates from the shape of the standard schedule by an amount that is the average deviation of 43 reasonably reliable marital fertility schedules in the early 1960s, representing a range of differences in the extent of fertility control, then m=1. Values of m higher than 1 are also possible. Not only an overall m, but also age-specific m's can be computed. If the model age-specific fertility schedule on which the m index is based fits the observed schedule perfectly, the overall m and the age-specific m's all have the same value. Thus the variance of the age-specific m's provides an indication of the validity of the m index. In applications where the age-specific m's are not consistent, age misreporting is frequently the cause of the inconsistency. The m index of marital fertility control is useful in instances where direct measures of the extent of contraceptive use for family limitation purposes is unavailable. These instances occur mostly for detailed cross-classified socio-economic categories and small geographic areas, for which our census sample provides sufficient numbers of cases, but for which fertility surveys that collect information on contraceptive use do not provide sufficient numbers of cases. As we shall see, however, the m index must be interpreted cautiously.

Findings

Fertility estimates for the whole country by urban-rural residence

Table 1 and Figure 2 show annual estimates of total fertility rates (TFR) and marital total fertility

Table 1 : Annual estimates of total fertility rates and marital total fertility rates by urban-rural residence, obtained by applying the own-children method to the 1981 census of Sri Lanka

Year	Whole Country		Urban		Rural			
					Total	Rural	Estate	
	TFR	MTFR	TFR	MTFR	TFR	MTFR	TFR	MTFR
1966	4650	6028	4655	6298	4649	5959	3292	4345
1967	4910	6417	4766	6584	4951	6378	3503	4678
1968	5024	6549	4753	6526	5099	6558	3333	4416
1969	4353	5724	4154	5839	4408	5700	3296	4422
1970	4674	6182	4331	6137	4769	6199	3437	4569
1971	4160	5556	3790	5475	4262	5581	3362	4423
1972	4179	5621	3723	5406	4305	5679	3137	4120
1973	3745	5086	3263	4765	3878	5170	2975	3933
1974	3785	5193	3192	4699	3950	5319	3425	4566
1975	3612	4980	3032	4517	3773	5100	3614	4889
1976	3681	5125	3083	4627	3849	5252	3468	4697
1977	3523	4960	2854	4376	3711	5110	3761	5101
1978	3578	5066	2796	4336	3798	5251	4023	5463
1979	3203	4570	2542	3971	3389	4722	3276	4430
1980	3556	5125	2806	4447	3768	5298	3793	5149

Notes: Estate, which is part of rural, is shown separately because estate fertility levels and trends are quite different from those of the rural population as a whole. Since the estate population is only a small fraction of the rural population, fertility trends for rural net of estate are about the same as the trends for rural as a whole, and therefore are not shown.

TFRs pertain to ages 15—49, whereas in this table and throughout this paper, MTFRs pertain to ages 20-49; see text for explanation of why ages 15-19 are omitted from the MTFR.

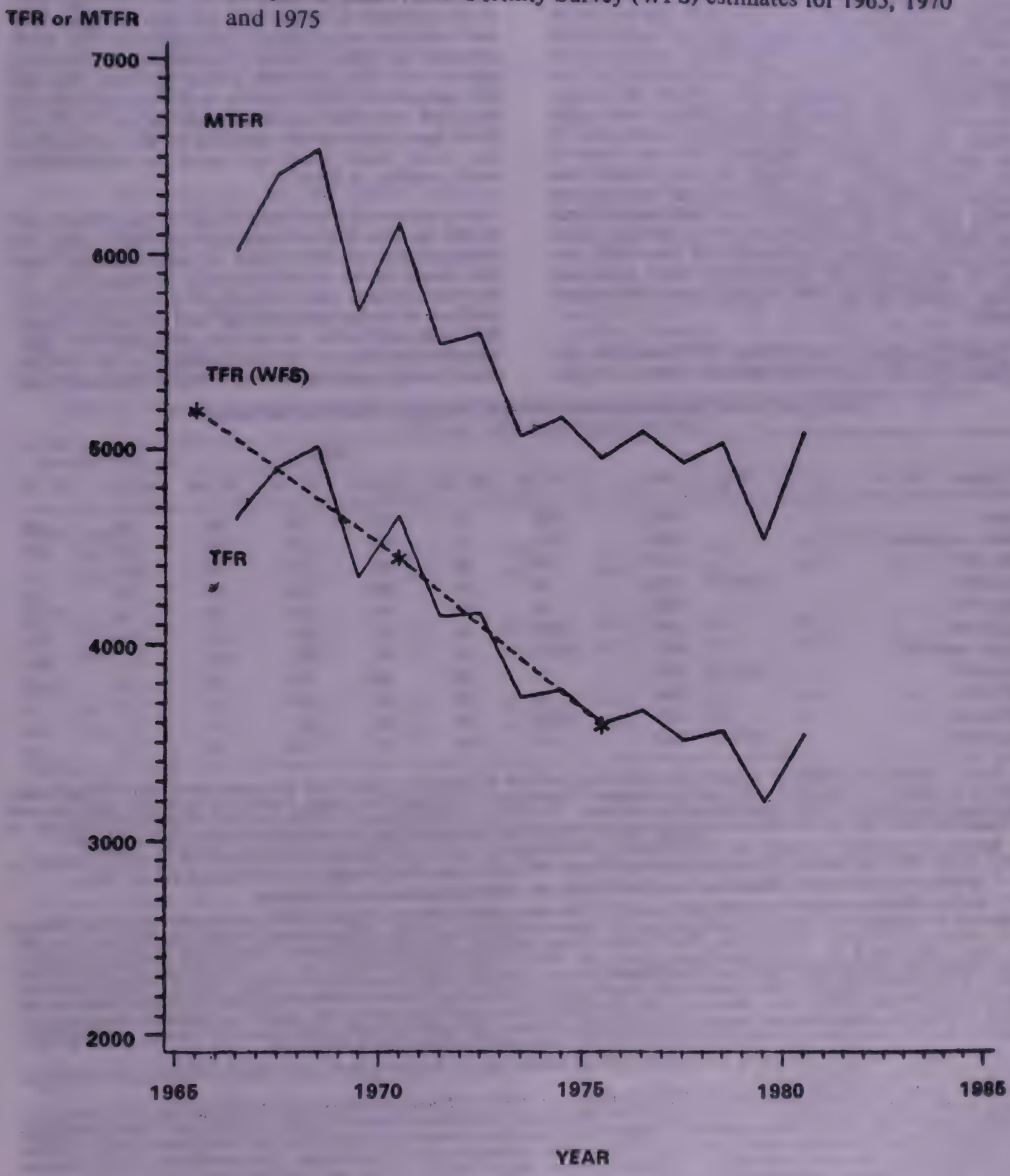
The 1981 census was held in March, 1981, which we take as 1981.2. Therefore, in this and all subsequent tables of own-children fertility estimtates, 1966 refers to the period 1966.2-1967.2, 1967 to 1967.2-1968.2, ..., and 1980 to 1980.2-1981.2.

In the tables and figures, TFRs and MTFRs are expressed as births per thousand women. In the text, they are sometimes expressed on a per woman basis.

[7]A.J. Coale and T.J. Trussell, "Model Fertility Schedules: Variations in the Age Structure of Childbearing in Human Populations," *Population Index* 40 (1974) : 185-258; "Erratum", *Population Index* 41 (1975): 572; "Technical Note : Finding the Two Parameters That Specify a Model Schedule of Marital Fertility", *Population Index* 44 (1978): 203-213. A computer program provided by the Office of Population Research at Princeton University was used to calculate the m index.

[8]L. Henry, "Some Data on Natural Fertility," *Eugenices Quarterly* 8 (1961): 81-91.

Figure 2 : Annual total fertility rates and marital total fertility rates for Sri Lanka estimated by applying the own-children "method to the 1981" census, compared with World Fertility Survey (WFS) estimates for 1965, 1970 and 1975



Source : Table 1 and Sri Lanka Deptt. of Census and Statistics, *World Fertility Survey*, 1975 : *First Report* (Colombo : Deptt. of Census and Statistics, 1978), p. 99.

rates (MTFR) derived by applying the own-children method to the 1981 census. Both measures show a fairly steady downward trend over the estimation period 1966-80. The trends are somewhat jagged, though not excessively so, probably due mainly to moderate heaping of children's ages, as shown in the age pyramid in Figure 1. The TFR declined from approximately 5 to 3.5 children per woman, and the MTFR from approximately 6.5 to 5 over the estimation period. These results confirm findings from earlier studies that marital fertility decline commenced in the mid-1960s, roughly coinciding with the start of Sri Lanka's family planning program, which was founded in 1965 and achieved all-island coverage by 1968.[9] Table 1 and Figure 2 show that marital fertility decline was particularly rapid during the initial years of the program and levelled off somewhat during the latter half of the 1970s, a trend confirmed more recently by the 1981 Contraceptive Prevalence Survey.[10]

Table 2 compares own-children TFR estimates for grouped calendar years with estimates based on vital registration as well as some estimates based on retrospective maternity histories collected in the 1975 World Fertility Survey (WFS) in Sri Lanka. The three TFR estimates based on the WFS are also graphed in Figure 2, where they are seen to agree very well with the own-children TFR estimates. The TFR estimates in Table 2 show a monotonically declining pattern over time, and this is true for some, but not all, age-specific birth rates as well. Irregularities in the trend over time occur especially in the 15-19 and 45-49 age groups at the extremes of the reproductive age range, where results are based on comparatively small numbers of births.

It is noteworthy in Table 2 that at ages 15-19 and 45-49, the own-children estimates are high relative to corresponding estimates based on other sources. Why this should be so is not clear, but the consistency of the bias indicates that the problem is not one of small numbers of births, which would lead to random rather than systematic error in the rate estimates. The most likely explanation of the discrepancies is that random errors in age reporting cause a slight flattening and

Table 2: Total fertility rates and age-specific birth rates : Sri Lanka, various years and sources

Source	Year	TFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Census		1953	5320	69	259	295	246	150	387
Census , registration		1963	5235	52	228	278	239	157	467
WFS 1965			5195	80	222	281	237	156	(58)
Own-child	1966-70		4718	69	196	248	216	138	59
WFS 1970			4455	54	175	249	217	133	58
Registration			1970	4225	38	172	238	219	134
Census, registration			1971	4160	40	184	232	199	131
Own-child	1971-75		3886	55	167	208	178	111	45
WFS 1975			3600	35	166	205	167	110	32
Rgistration			1978	3550	39	184	211	151	94
Own-child	1976-80		3505	49	160	191	154	94	39

Notes : For sources designated "census, registration," numerators of birth rates are taken from birth registration statistics, and denominators are taken from the census. For sources designated "registration," numerators are taken from birth registration statistics, and denominators are based on inter-censal populaltion estimates. Birth rate estimates from the WFS (the 1975 World Fertility Survey in Sri Lanka) are based on retrospective maternity histories and information on proportions married from the WFS household sample.

Because of truncation of women's ages for years before the WFS survey, rates cannot be computed for ages 45-49 in 1970 and 40-49 in 1965. At ages 45-49, the rate for 1975 was used also for 1970 and 1965, and at ages 40-44, the rate in 1970 was used also for 1965.

In this paper, age-specific birth rates are expressed as births per thousand woman-years of exposure.

Sources : Estimates for 1953 and 1963 are from D.F.S. Fernando, *Fertility Trends in Ceylon* 1953-68 *and the National Family Planning Programme*, Monograph No. 17 (Colombo: Department of Census and Statistics, 1970). WFS estimates for 1965 and 1970 are from Sri Lanka Department of Census and Statistics, *World Fertility Survey*, *Sri Lanka*, *First Report* (Colombo: Department of Census and Statistics, 1978), Table 5.14, P. 99. Registration-based estimates for 1970 are from D.F.S. Fernando, *op. cit.* Estimates for 1971 are from Sri Lanka Department of Census and *Statistics, *World Fertility Survey*, *Sri Lanka*, *First Report*, *op. cit.*, Table 1.2, p. 6. WFS estimates for 1975 are from D.F.S. Fernando, "The Continuing Fertility Decline in Sri Lanka, " *Journal of Biosocial Science* 12 (1980): Table 6, p. 56. Estimates for 1978 are from A.T.P.L. Abeykoon, "The Post-War Demographic Experience of Sri Lanka", in Sri Lanka Department of Census and Statistics, *Socio-Economic Development and Fertility Decline in Sri Lanka* (Colombo: Department of Census and Statistics), Table 5, p. 9. The own-children estimates are based on the 1981 census and are taken from Table 4 below.

*Sri Lanka Department of Census and Statistics, *World Fertility Survey*, *Sri Lanka*, 1975, *First Report* (Colombo: Department of Census and Statistics, 1978), pp. 6, 8.

**Sri Lanka Department of Census and Statistics, *Report on the* 1981 *Contraceptive Prevalence Survey* (Colombo: Department of Census and Statistics, forthcoming). The leveling off of fertility since the mid-1970s is probably more pronounced than Figure 2 indicates; comparison with registered births suggests that the 0-4 age group in the census is about 5 per cent smaller than it should be (perhaps because of a tendency to round up children's ages, in addition to some possible underenumeration), implying that the own-children fertility estimates for the 5-year period immediately preceding the census are too low. For a discussion of the 5-per cent discrepancy between the 0—4 age group in the census and registered births, see I. Alam and J. Cleland, *Illustrative Analysis; Recent Fertility Trends in Sri Lanka*, World Fertility Scientific Reports No. 25 (London: World Fertility Survey, 1981), p. 46.

spreading of the age pattern of fertility that tends to lower age-specific rates in the middle of the reproductive age range and raise them toward the tails. This effect might be more noticeable in census-based estimates than in registration-based or survey-based estimates, because ages are probably recorded more accurately in registration and in surveys than in the census, where enumerators are less well trained and where the household head frequently reports on behalf of the entire household. Such a slight flattening and spreading of the own-children estimates relative to the estimates from other sources is observed to some extent in Figure 3.

On the whole, however, the own-children estimates agree rather well with the estimates from other sources, and this agreement is illustrated also in Figure 3, which plots the age patterns of fertility for 1970 and 1978, based alternatively on own-children estimates from the 1981 census, vital registration, and the WFS. (Since the WFS survey was taken in 1975, WFS estimates are necessarily omitted in the 1978 comparison). In this case the own-children fertility estimates pertain to single calendar years that are not shown in the text tables; the WFS and registration-based estimates are from Table 2.

Table 1 shows TFRs and MTFRs not only for the whole country but also for urban and rural areas of the country. These are graphed additionally in Figures 4 and 5. In the mid-1960s, urban and rural TFRs and MTFRs differed little, but they diverged over the estimation period, with urban fertility falling more than rural fertility. By 1980, the urban TFR and MTFR were both about one child lower per woman than the rural TFR and MTFR, respectively. The divergence between the urban and rural TFR over the period was due primarily to a divergence in marital fertility immediately following establishment of the national family planning program in the latter half of the 1960s and was not due, at least not significantly so, to age at marriage rising more rapidly in urban than in rural areas. This conclusion is supported by the nuptiality data in Table 3, which shows that age at marriage increased only by about one year between the 1971 and 1981 censuses, with the increase only slightly greater for urban areas than for rural areas.

Table 3 : Singulate mean age at marriage and age-specific proportions currently married, by urban-rural residence : Sri Lanka, 1971 and 1981 (proportions in per cent)

Residence and year	SMAM	Age						
		15—19	20—24	25—29	30—34	35—39	40—44	45—49
Whole country								
1971 . . .	23.5	10.3	46.0	73.5	85.9	89.3	87.9	84.9
1981 . . .	24.4	10.1	43.8	68.2	81.1	85.7	85.8	83.8
Urban								
1971 . . .	23.9	8.9	41.3	69.5	83.3	86.7	85.9	82.7
1981 . . .	25.3	8.0	36.5	61.3	78.6	83.6	84.3	83.9
Rural								
1971 . . .	23.4	10.7	47.3	74.7	86.7	90.0	88.4	85.4
1981 . . .	24.1	10.7	45.8	70.1	81.8	86.3	86.2	83.8
Estate								
1971 . . .	23.5	8.7	46.8	76.9	87.4	89.4	86.8	83.4
1981 . . .	23.6	10.4	49.3	74.7	84.1	87.8	85.8	80.5

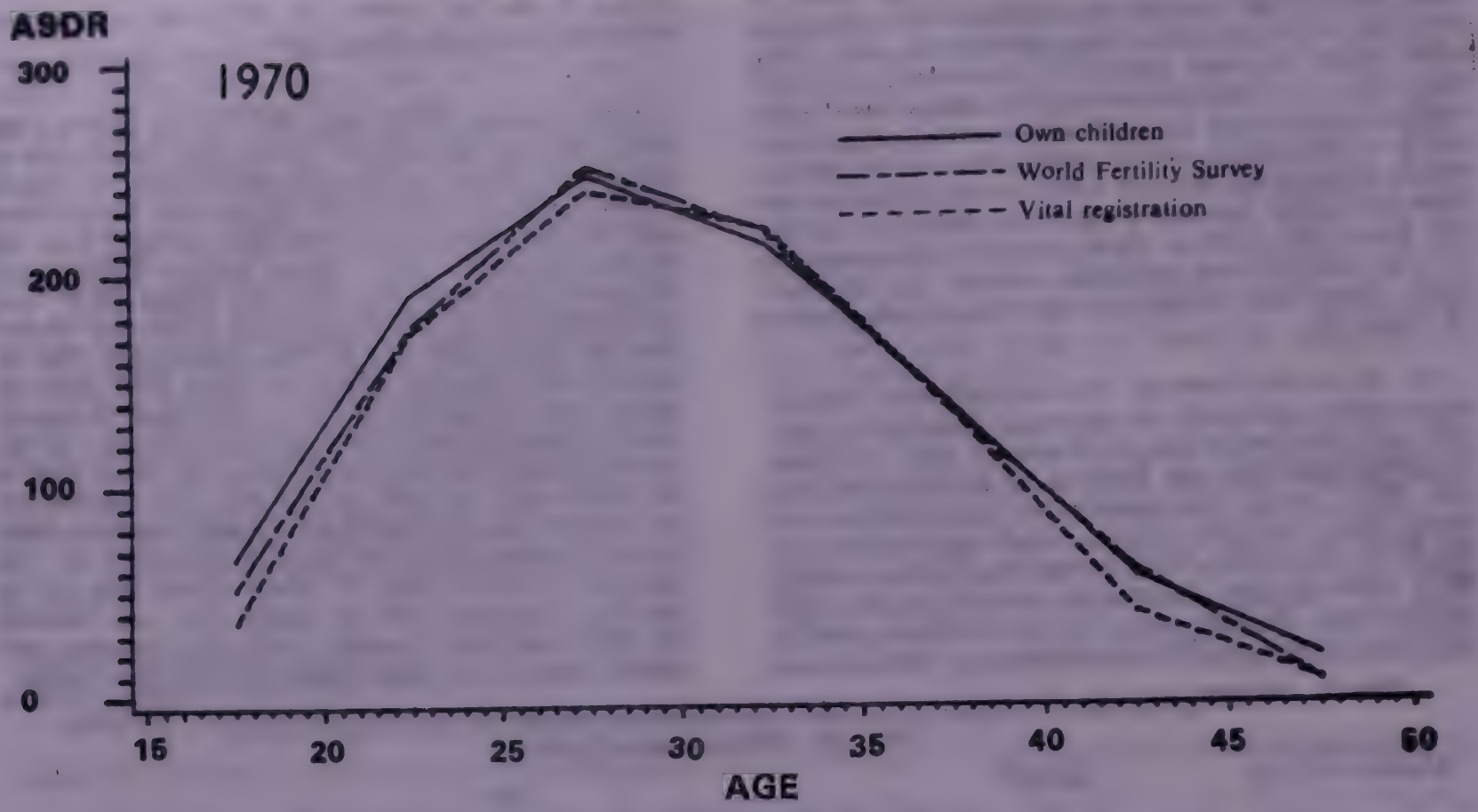
Source—Computed from 10 per cent sample tapes from the 1971 and 1981 censuses.

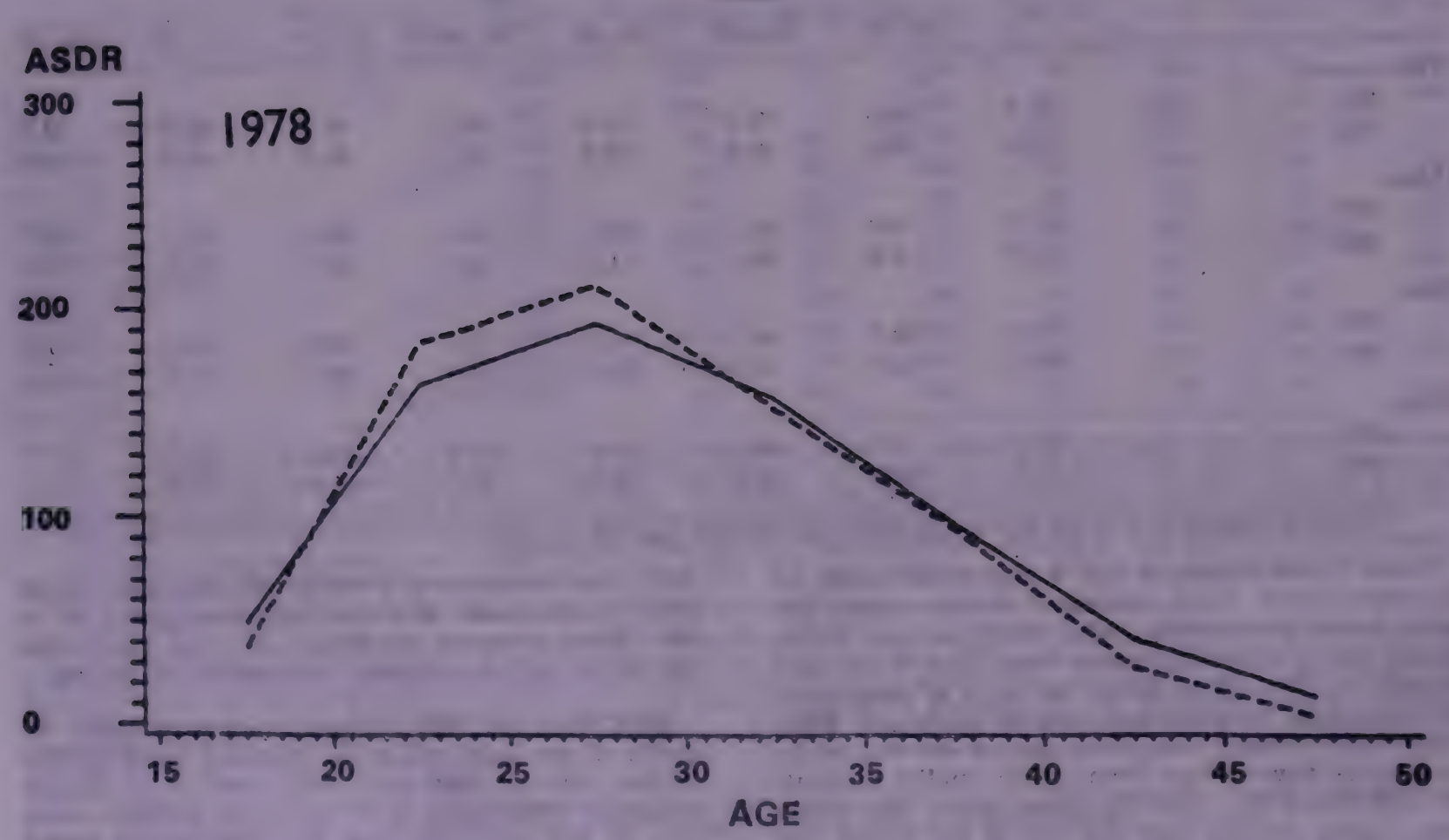
Table 1 and Figures 4 and 5 also show trends for the estate sector, which consists of the tea estates. The estate sector is ethnically about 85-90 per cent Indian Tamil, and it constitutes about 8 per cent of the rural population. The estate sector has been of long-standing interest to demographers because its fertility behaviour differs considerably from that of the rest of the country. A few findings from earlier studies illustrate the differences: In 1946 the estate sector had somewhat higher fertility than the rest of Sri Lanka, but between 1946 and 1953 its crude birth rate fell substantially from about 42 to 35 per thousand, while that of Sri Lanka as a whole remained fairly constant at 39-40. The crude birth rate in the estate sector fell further to about 27 by 1963, then rose to about 33 by 1971. For Sri Lanka as a whole over this same period 1963-71, the crude birth rate fell from about 40 to 30.[11] These estimates are based on vital registration for births and on censuses for population at risk.

Data from the 1981 census call into question the reality of the large and rapid estimated estate fertility decline between 1946 and 1953, from 42 to 35 per thousand, constituting a 17 per cent fertility reduction. If this reduction were real, one would expect the 1981 census age pyramid for the estate sector to show a sharp indentation below age 30 or so. But this is not observed (pyramid not shown). The data do suggest, however, that estate fertility did decline steadily over the 1950s. This more gradual decline

[11]C.M. Langford, *The Fertility of Tamil Estate Workers in Sri Lanka*, World Fertility Survey Scientific Reports No. 31 (London: World Fertility Survey, 1981), p. 13.

Figure 3 : Comparison of age-specific birth rates for 1970 and 1978 estimated alternatively from the 1981 census (own-children method), from the 1975 World Fertility Survey in Sri Lanka, and from vital registration



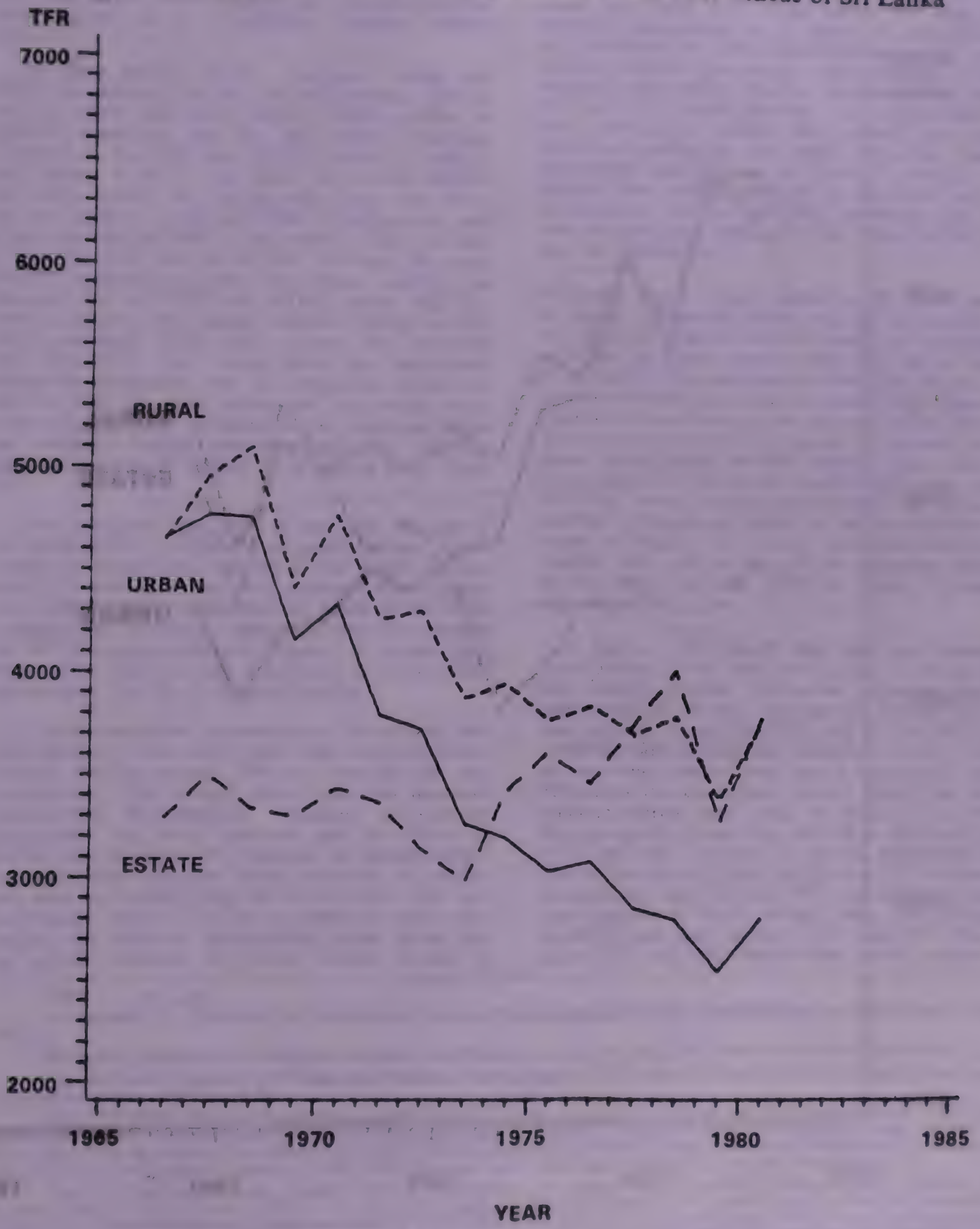


Note · Since calendar years for the own-children (OC) estimates run from March to March (because the 1981 census was taken in March), the own-children estimates in both figures are interpolated to run from January to January in order to produce rates comparable with those from the other sources. For example, the own-children estimates of age-specific birth rates for 1970 in the figure are obtained as

$$F_{1970} = .2\ F^{OC}_{1969} + .8\ F^{OC}_{1970}\ .$$

Source Table 2 and unpublished tabulations of fertility estimates derived by applying the own-children method to the 1981 census of Sri Lanka.

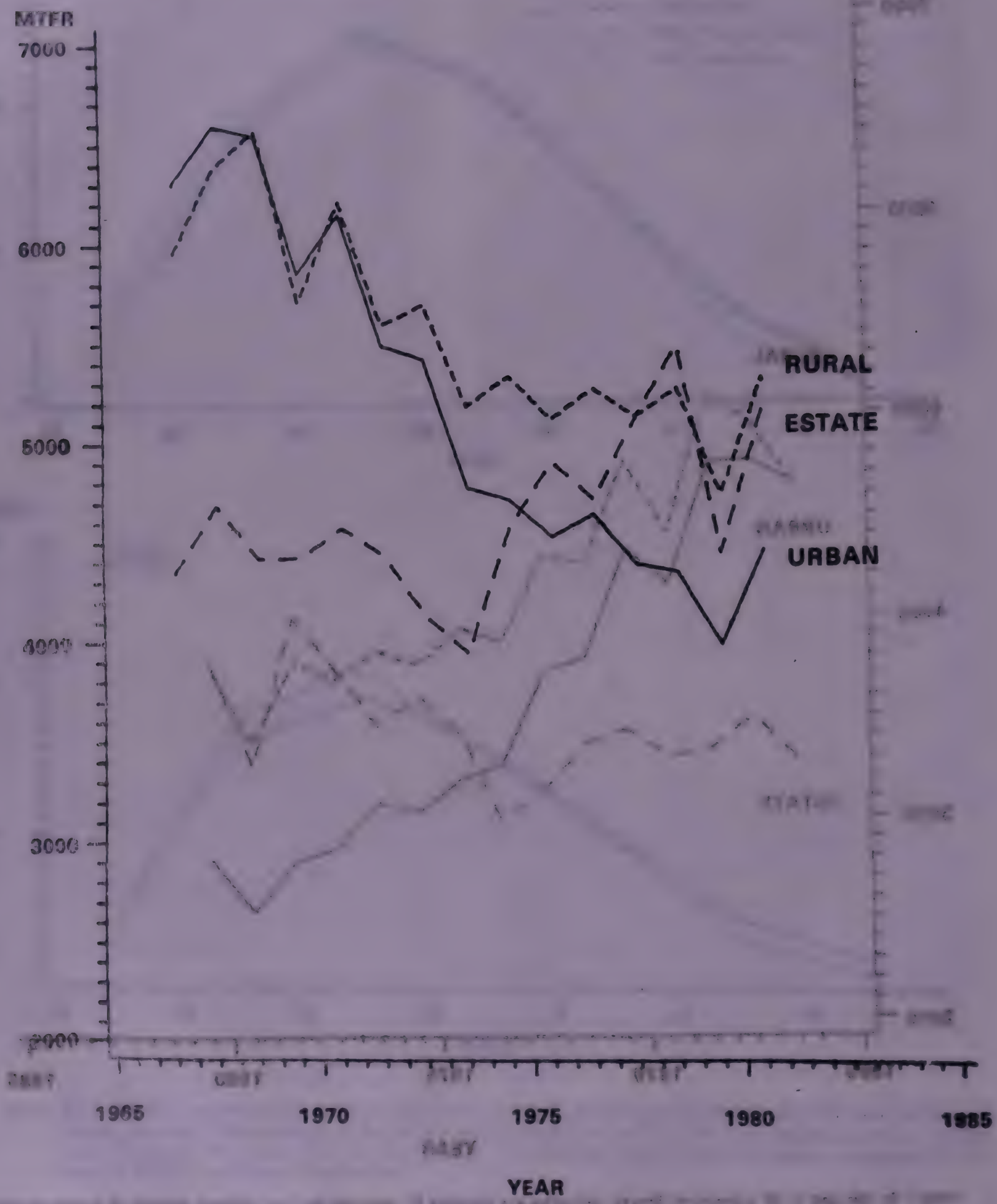
Figure 4: Annual total fertility rates by urban-rural residence estimated by applying the own-children method to the 1981 census of Sri Lanka



Note : In this and in all subsequent figures, estimates are obtained by applying the own-children method of fertility estimation to the 1981 census, unless otherwise indicated.

Source : Table 1

Figure 5 : Annual marital total fertility rates by urban-rural residence



Source : Table 1.

probably occurred primarily because of rising age at marriage. Previous studies have generally accepted the reality of the estimated decline between 1946 and 1953, and one of them suggests that induced abortion might account for it, a possibility discussed further below.[12]

The estate sector's fertility increase during the 1960s, as indicated by the above-mentioned upward trend in crude birth rates found in earlier studies, is generally consistent with the own-children estimates of trends in the TFR and MTFR shown in Table 1 and Figures 4 and 5. The table and figures confirm that estate fertility was substantially lower than overall rural fertility in the mid-1960s, by about one and a half children per woman, on average. This was true of both the TFR and the MTFR. However, the own-children estimates suggest that estate fertility, as measured by the TFR and MTFR rather than the crude birth rate, was roughly constant during the late 1960s and early 1970s, with a steep rise occurring only after 1974. The results show that rural-estate differences diminished over the estimation period, so that by 1980 the estate sector and the overall rural sector were virtually indistinguishable regarding these two summary fertility measures (and also regarding their age patterns of fertility, as is evident from Table 3).

Table 3 suggests that some of the TFR increase in the estate sector in Figure 4 occurred because of increases in proportions married in the highly fecund ages 15-19 and 20-24; but these increases were modest and could not have accounted for much of the TFR increase. And, of course, they accounted for none of the MTFR increase shown in Figure 5. It is clear that most of the TFR increase subsequent to 1974 occurred because of a rise in marital fertility.

A rather speculative explanation of the marital fertility increase in the estate sector that occurred rather abruptly starting around 1974 is a possible (but not documented) trend toward shorter and less intensive breastfeeding. Breastfeeding lengthens post-partum amenorrhea and birth intervals, and its effects on fertility can be large. For example, in noncontracepting populations with low infant mortality, a population with no breastfeeding can have a birth rate approximately twice as high as a population with very lengthy and intensive breastfeeding, other things being equal.[13] Although the World Fertility Survey in Sri Lanka found that breastfeeding was only slightly longer in the estate sector than in the rural population as a whole in 1975[14] breastfeeding in the estate sector may have been longer earlier and may have declined subsequently as a result of nationalization of the estates in 1975. With nationalization, estate workers became government employees and obtained access to government benefits, including better maternal and child health services. The improvement of such government services may actually have begun before nationalization was legally completed. Possibly breastmilk substitutes in the form of powdered milk became more widely available on the estates with nationalization, but we have been unable to find trend data on powdered milk sales that would allow us to test this hypothesis.

Figures 6 and 7 show trends for the whole country in annual age-specific birth rates for all women and for currently married women (based on own-children estimates for single calendar years that are not shown in the tables). The trends are downward at all ages. The downward trend in age-specific marital birth rates coincides with the advent of the national family planning. Before the advent of the program, as indicated by previous studies based on vital statistics, there was very little change in age-specific marital birth rates, except for 15-19 where a substantial increase was noted.[15] In contrast, a surprising finding in the own-children estimates in Figure 7 is a sharp downward trend in the marital birth rate at ages 15-19; moreover, the level of this rate in the late 1960s in Figure 7 is exceedingly high.[16]

In Figure 7, the initially high level and subsequent steep decline in the birth rate at ages 15-19 are probably largely spurious. Alternative estimates based on vital statistics indicate that marital fertility at 15-19 rose not only during the 1950s and the first half of the 1960s but also during our estimation period 1966-80, as one would expect when age at marriage is rising.[17] Why does this discrepancy occur? Recall that in calculating marital birth rates, we fitted a line through the age-specific proportion married at each age in the 1971 and 1981 censuses. To get the proportions married at that age for years previous to 1971, the line was extrapolated. But between 1971 and 1981 the proportion married at 15-19 changed very little. If age at marriage rose faster between 1961 and 1971 than between 1971 and 1981 (which other studies indicate was

[12] *Ibid.*

[13] J. Bongaarts, "A Framework for Analyzing the Proximate Determinants of Fertility," *Population and Development Review* 4 (1978): 105-132.

[14] Sri Lanka Department of Census and Statistics, *World Fertility Survey, Sri Lanka, 1975, First Report, op. cit.* in footnote 9, p. 140.

[15] See Sri Lanka Department of Census and Statistics, *The Population of Sri Lanka*, C.I.C.R.E.D. Series (Colombo: Department of Census and Statistics, 1974), pp. 9-10.

[16] The 1975 World Fertility Survey in Sri Lanka showed a decline in marital fertility at ages 15-19 rather similar to that observed in the own-children estimates based on the 1981 Census, but since the dating of events in maternity histories is strongly affected by the same kinds of age misreporting that distort own-children fertility estimates, the WFS estimates at 15-19 are probably distorted in much the same way as the own-children estimates; for the WFS estimates, see I. Alam and J. Cleland, *op. cit.* in footnote 10, p. 87.

[17] See T.W. Pullum, *Illustrative Analysis: Fertility Preferences in Sri Lanka*, World Fertility Survey Scientific Reports No. 9. (London: World Fertility Survey, 1980), p. 14; and C.M. Langford, "Fertility Change in Sri Lanka Since the War: An Analysis of the Experiences of Different Districts", *Population Studies* 35 (1981): 296. One expects marital fertility at ages 15-19 to increase as age at marriage rises, principally because fertility in this age group tends to become concentrated at the older end of the age group, where fertility is higher and because those who marry at 15-19 tend to be increasingly selected for high fertility. If a trend toward shorter and less intensive breastfeeding is also occurring, it would also contribute to increase fertility at ages 15-19.

Figure 6 : Annual age-specific birth rates : whole country

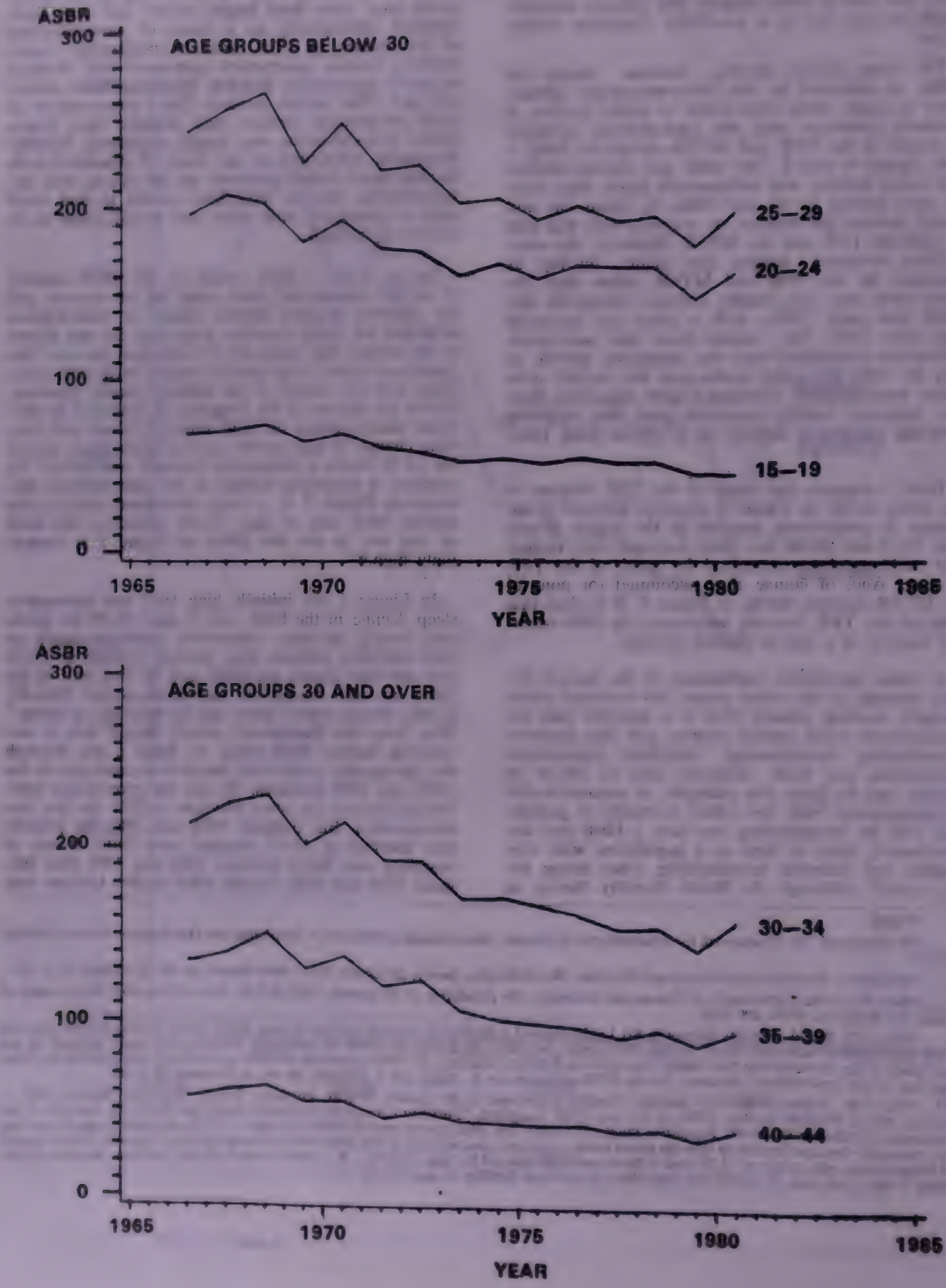
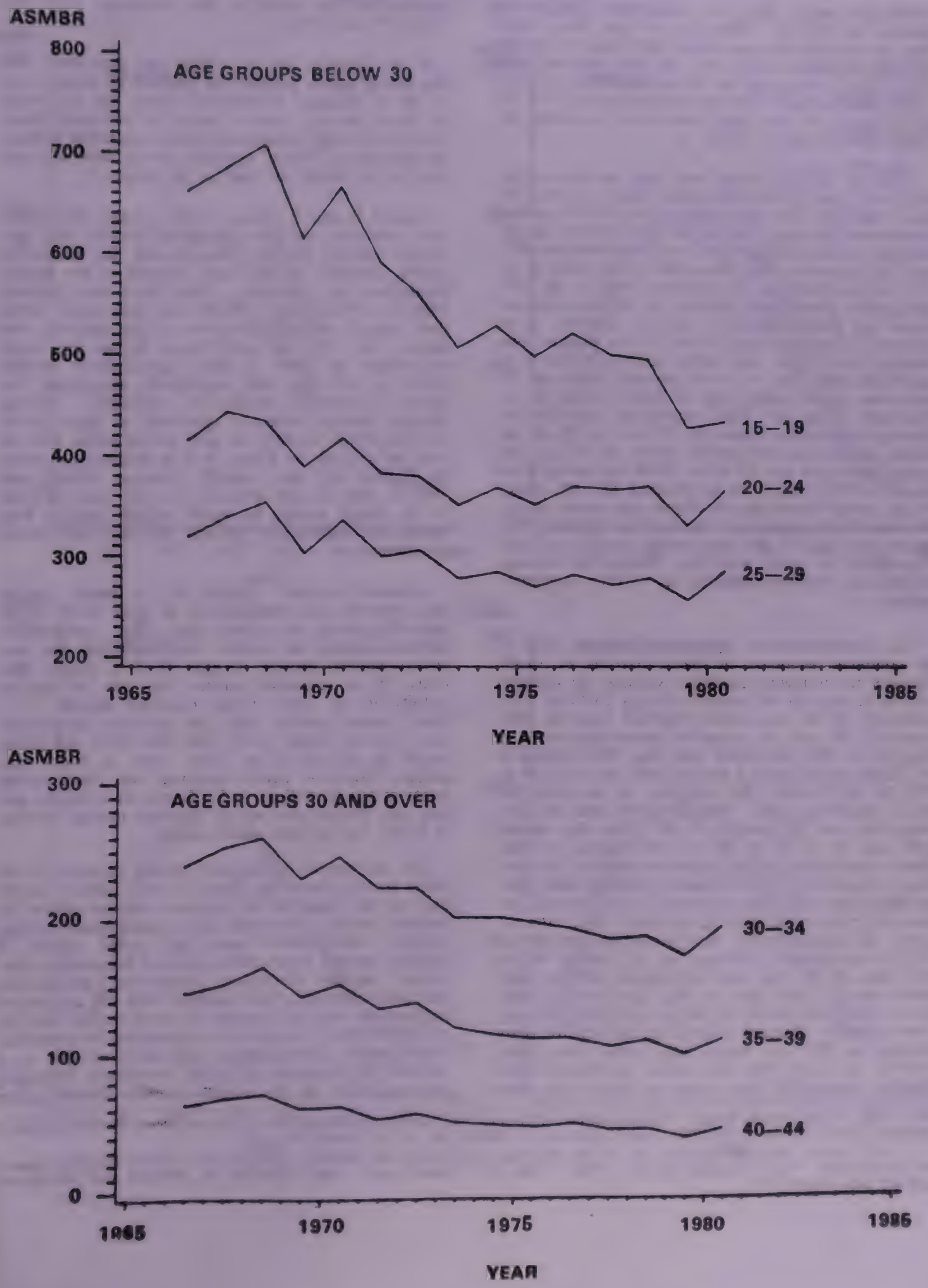


Figure 7 : Annual age-specific marital birth rates : whole country



indeed the case),[18] then our extrapolated proportions married for the late 1960s are too low. Then, when they are divided into age-specific birth rates to obtain age-specific marital birth rates, the latter are too high. This effect is enhanced by the earlier-noted tendency of the own-children estimates of fertility at 15-19 for all women to be too high, and more so during the 1960s than during the 1970s.

There is another reason why the marital fertility decline at ages 15-19 is probably largely or even entirely spurious. This reason has to do with the marked improvement in age reporting (as indicated by less age heaping on ages ending with 0 or 5) between the 1971 and 1981 censuses. The substantial age heaping in the 1971 census produces a systematic bias in the 1971 age-specific proportions married for the conventional 5-year age groups used here. Let us consider, as an example, heaping on age 20 and let us suppose that heaping occurs from both above and below age 20 in equal amounts. That is, some persons below age 20 and some persons above age 20 report themselves erroneously as age 20. This heaping has the effect of moving misreporters below age 20 into the 20-24 age group, but leaving misreporters above age 20 (as long as they are below age 25) in the 20-24 age group. Thus because of the pattern of age heaping and the choice of age group boundaries, the 5-year age groups are in fact somewhat younger on average than reported. This means that in 1971 the age group reported as 15-19 is probably in reality somewhat younger on average, so that the proportion married at 15-19 is underestimated.

This underestimation can produce serious bias in the computed estimates of marital fertility at 15-19. Consider the following example: Suppose the age-specific birth rate for all women at ages 15-19 in 1971 (estimated by the own-children method from the 1981 census) is 60, and the estimated proportion currently married in 1971 (estimated from the 1971 census) is .10. These values imply a marital birth rate at 15-19 in 1971 of 60/.10=600. But suppose, in line with the above reasoning about possible error, that the true proportion was .12 instead of .10. Then the marital birth rate at 15-19 is 60/.12=500 instead of 600. Thus a small error in the proportion married can produce a large error in the estimated marital birth rate. At older ages this kind of error is not serious, because the proportions married are much larger; for example, if, hypothetically, the proportion married at 35-39 is erroneously estimated as .85 instead of the true value of .87, the error introduced into the computed marital birth rate for that age group is only about 3 per cent instead of 20 per cent as in the previous example. Because proportions married for years previous to 1971 are extrapolated rather than interpolated, the errors from this source in estimated proportions married for these years are likely to be even greater than the errors for the intercensal years between 1971 and 1981.

If age heaping has the effects just described, then one would expect proportions married by single years of age to increase dramatically from age 19 to age 20, since married women below 20 are more likely to have their ages exaggerated than unmarried women. An analysis of World Fertility Survey data indicates that this is indeed the case in Sri Lanka.[19]

Figures 8 and 9 present further detail, by urban-rural residence, on how age-specific fertility and age-specific marital fertility changed over the estimation period, 1966-80. In this case, because of the further breakdown by residence, only three time periods, 1966-70, 1971-75 and 1976-80, are considered, rather than annual estimates as given in the previous two figures. The rates on which these figures are based are shown in Table 4. Both figures show fertility decline at all ages, and, as already mentioned, the decline in marital fertility is especially striking (though almost certainly spurious) at ages 15-19. For the whole country, as well as for urban and for rural as a whole in Figure 9, it is evident that marital fertility fell more rapidly between 1966-70 and 1971-75 than it did between 1971-75 and 1976-80. In the estate sector, as noted earlier, fertility rose during the estimation period and did not follow this pattern.

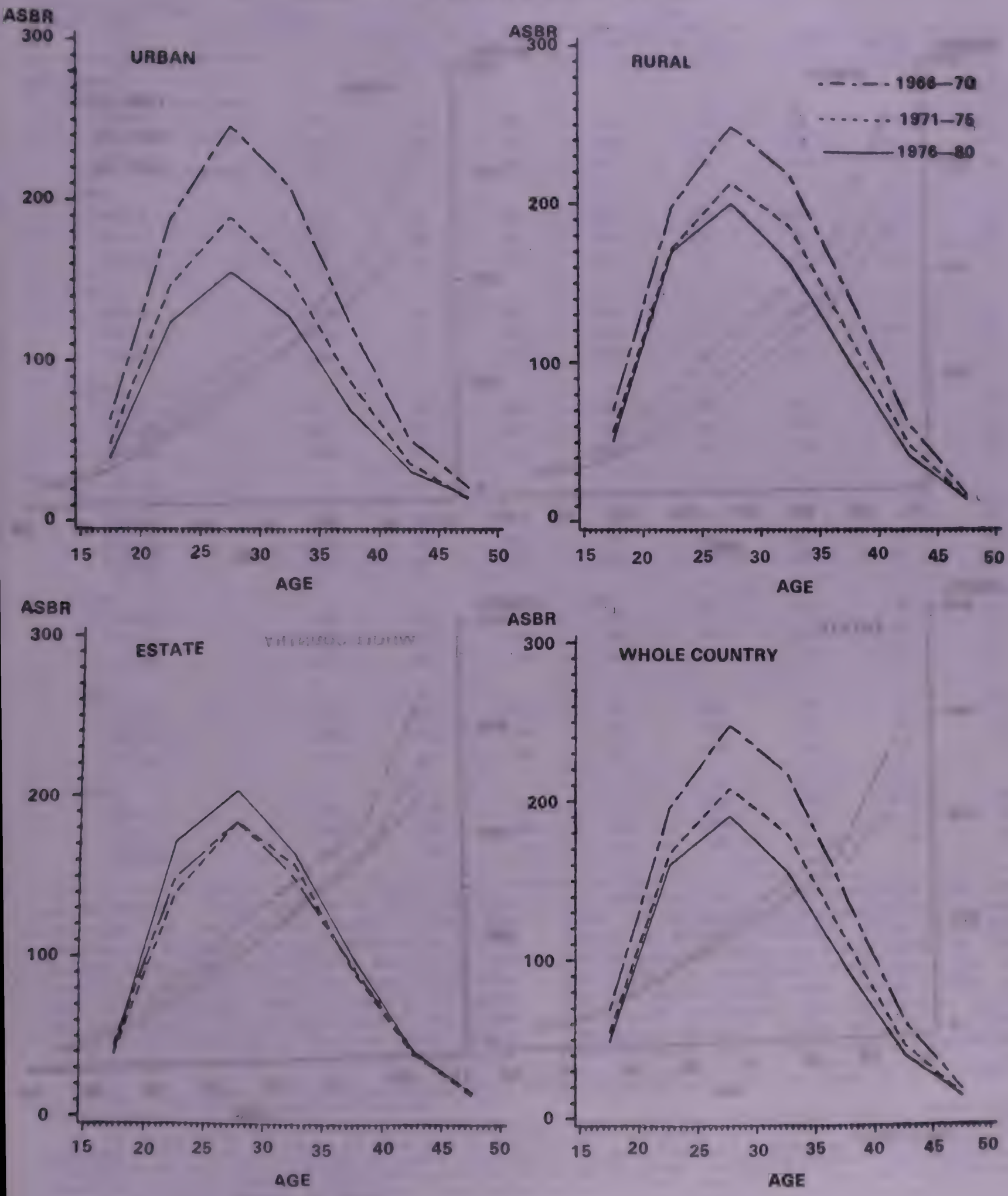
Estimated marital fertility in the estate sector did, however, fall substantially at ages 15-19, while generally rising at other ages. This implausible finding supports our earlier hypothesis that the decline in marital fertility at ages 15-19 is largely spurious. If, as suggested earlier, the rise in marital fertility in the estate sector occurred because of a trend toward shorter and less intensive breastfeeding, it seems highly likely that the 15-19 age-group would be affected in the same way as older age-groups. Moreover, age at marriage was rising in the estate sector as well as in Sri Lanka as a whole, and this rise should also act to increase marital fertility at 15-19, for reasons noted earlier.

The age pattern of marital fertility increase in the estate sector, shown in Figure 9 and Table 4, sheds light on the causes of the increase. At ages above 20, marital fertility increases are concentrated at the younger reproductive ages, as would expect if younger women were shifting toward breastmilk substitutes, thereby shortening post-partum amenorrhea and birth intervals. This conflicts with the alternative explanation that the increase in estate marital fertility occurred mainly because of a relaxation of conscious birth control (contraception and abortion) due to a marked improvement of living conditions following nationalization of the estates in 1975. Contraception

[18]See, for example, N. Wright, "The Relationship of Demographic Factors and Marital Fertility to the Recent Fertility Decline," *Studies in Family Planning* 1 (59) (1970); and I. Alam and J. Cleland, *op. cit.* in footnote 10, p. 87.

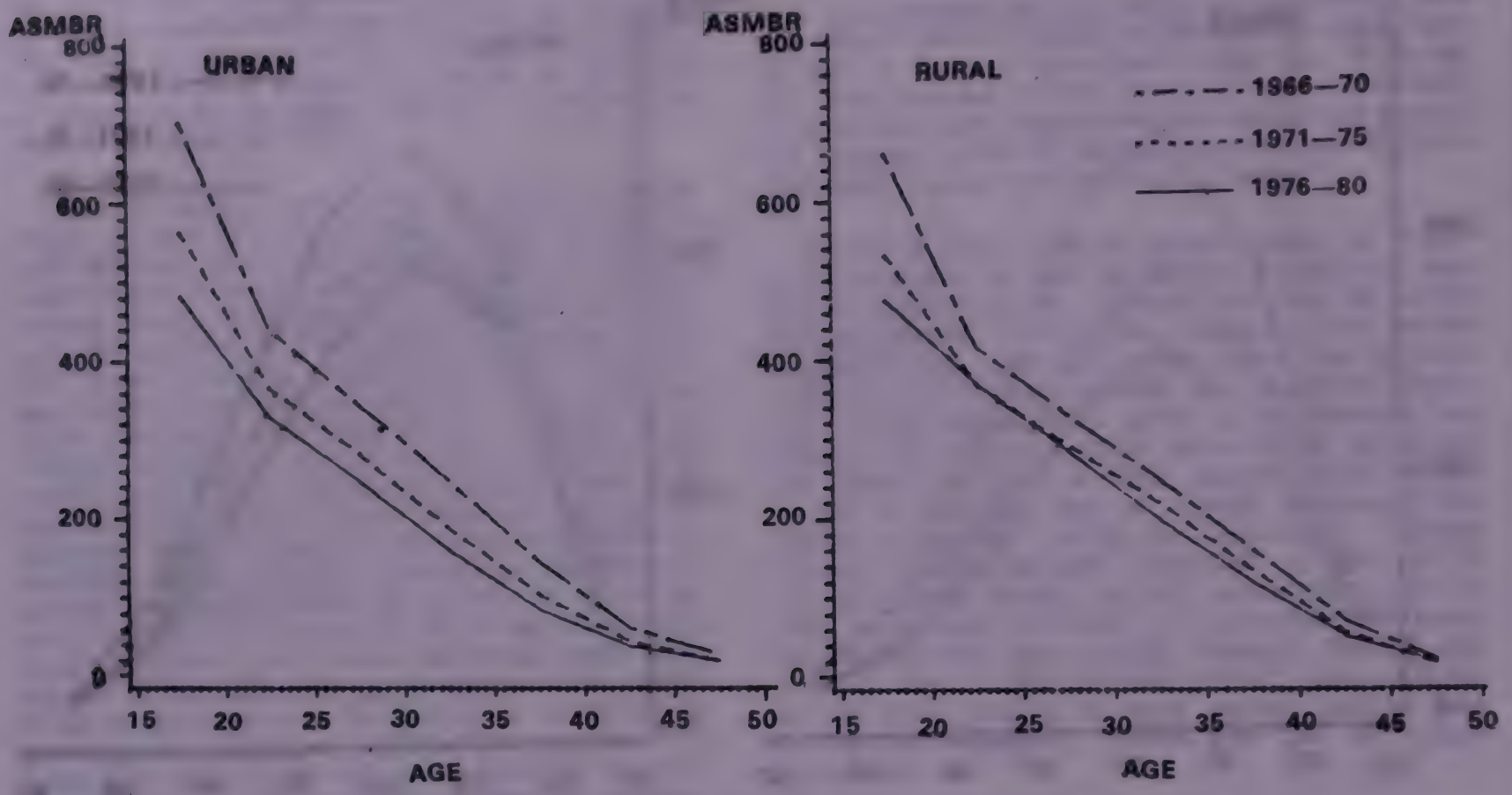
[19]J. Trussell, *Illustrative Analysis: Age at First Marriage in Sri Lanka and Thailand*, World Fertility Survey Scientific Reports No. 13 (London: World Fertility Survey, 1980), Table 10. Trussell notes many difficulties in assessing and interpreting nuptiality data at ages 15-19.

Figure 8 : Age-specific birth rates by urban-rural residence for 1966-70, 1971-75, and 1976-80



Source : Table 4

Figure 9 : Age-specific marital birth rates by urban-rural residence for 1966-70, 1971-75, and 1976-80



Source : Table 4

Table 4 : Total fertility rates and age-specific birth rates for all women and for ever-married women by urban-rural residence, estimated by applying the own-children method to the 1981 census of Sri Lanka

Marital status, residence, and time period	TFR or MTFR	Age						
		15–19	20–24	25–29	30–34	35–39	40–44	45–49
All women								
Whole country								
1966-70	4718	69	196	248	216	138	59	17
1971-75	3886	55	167	208	178	111	45	13
1976-80	3505	49	160	191	154	94	39	13
Urban								
1966-70	4522	64	188	247	209	124	51	21
1971-75	3385	49	147	190	153	88	36	14
1976-80	2811	40	124	156	127	70	31	15
Rural								
1966-70	4772	71	198	249	217	142	61	16
1971-75	4024	57	172	213	185	117	48	13
1976-80	3700	51	170	201	162	101	41	13
Estate								
1966-70	3372	45	150	184	148	92	40	15
1971-75	3307	39	140	184	156	90	39	13
1976-80	3665	40	172	204	163	98	41	15
Married women								
Whole country								
1966-70	6174	667	419	330	246	153	66	20
1971-75	5275	536	366	287	210	125	52	16
1976-80	4965	477	361	275	187	109	45	16
Urban								
1966-70	6265	702	439	342	246	142	59	25
1971-75	4955	564	364	280	185	102	42	17
1976-80	4345	482	328	245	158	83	36	18
Rural								
1966-70	6154	660	414	327	246	156	68	19
1971-75	5360	532	366	289	216	131	54	15
1976-80	5124	476	369	282	195	116	48	15
Estate								
1966-70	4487	546	326	237	168	102	46	18
1971-75	4393	434	296	241	180	101	46	16
1976-80	4967	402	353	271	192	111	48	19

on the estates is concentrated at the older reproductive ages,[20] and there is every reason to believe that abortion, to the extent that it is practised, is used for limiting rather than spacing births and is also concentrated at the older reproductive ages. (Unfortunately, data on abortion, which is illegal in Sri Lanka, are not available). Thus it seems unlikely that a relaxation of contraception or abortion could account for the fertility increase on the estates, which occurred mainly at the younger reproductive ages, after 1974. By the same token, it seems unlikely that abortion is the primary explanation of the exceptionally low fertility observed on the estates during the 1950s and 1960s. The own-children results suggest that during this earlier period, estate marital fertility was low at all reproductive ages, indicating a spacing mechanism (probably lengthy and intensive breastfeeding) rather than a family limitation mechanism.[21]

[20]Sri Lanka Department of Census and Statistics, *World Fertility Survey, Sri Lanka*, 1975, *First Report*, *op. cit.* in footnote 9 See also Langford, *op. cit,* in footnote 11, page 88.

[21]It is noteworthy that the average period of breastfeeding following a birth was, by South Asian standards, not very long in Sri Lanka in 1975, being 11.9 months for urban, 15.2 for rural as a whole, and 15.8 for estate in the World Fertility Survey, which is the first survey in Sri Lanka to provide this kind of information; see Sri Lanka Department of Census and Statistics, *World Fertility Survey, Sri Lanka*, 1975, *First Report*, *op.cit.* in footnote 9, p. 140. In contrast, average breastfeeding intervals of more than 20 months are common in India, Pakistan, and Bangladesh. Breastfeeding among estate Tamils may have been longer and more intensive in the 1950s and 1960s than in 1975.

Table 5 : Values of the m index of marital fertility control by urban rural residence

Time Period	Whole Country	Rural		
		Urban	Total rural	Estate
1966-70 . .	.60	.72	.57	.67
1971-75 . .	.68	.84	.64	.64
1976-80 . .	.77	.88	.74	.72

Note.—Input data for calculation of m are age-specific marital birth rates (20-44) obtained by dividing age-specific birth rates in 5-year age groups derived by applying the own-children method to the 1981 census, by age-specific proportions currently married interpolated or extrapolated for single calendar years from values given in the 1971 and 1981 censuses.

Table 5 and Figure 10 present trends in the m index of marital fertility control. We computed m in two different ways, based on marital fertility in 5-year age groups first for age-groups 20-24 through 40-44, and second for age-groups 20-24 through 45-49. Results based on the second alternative were highly erratic, but results based on the first alternative were fairly consistent; i.e., the age-specific values of m for age groups 20-24 through 40-44 had a small variance. The results from the first alternative indicated why the second alternative gave poor results. The fitted model of age-specific marital fertility based on age groups 20-24 through 40-44 showed that the observed marital birth rate at ages 45-49 was much higher than the model value. At ages 20-24 through 40-44, on the other hand, observed and model values generally agreed quite well. Thus the fitted model confirms our earlier observations relating to Table 2, in which it was found that the own-children estimates of fertility at ages 45-49 were considerably and probably spuriously higher than corresponding estimates from other sources. Accordingly, the values of m presented here are based on ages 20-44 only.

The first panel of Figure 10 shows annual estimates of m, computed from the age-specific marital birth rates derived by applying the own-children method to the 1981 census as described earlier. The trends for the whole country and for total rural (i.e., rural including estate, comprising about 78 per cent of the country's population in 1981) are fairly smooth, but the trends for the urban and estate sectors are more jagged. The trend of annual estimates for each of the 6 geographic zones and 24 districts (not shown) are even more jagged. These findings suggest that the principal reason for jaggedness in the trends is small sample size. If we recall that our values of m are based only on age-specific marital birth rates between ages 20 and 45, then, from Figure 9, it is apparent that only very slight changes due to sampling variation in the shape of the age curve of marital fertility can cause substantial changes in the value of m. Thus the sample size in each category or area must be quite large in order to get reliable estimates of m.

On the other hand, when values of m are computed for the three aggregated 5-year time periods, 1966-70, 1971-75, and 1976-80, based on own-children estimates of age-specific marital birth rates for these time periods (effectively multiplying the sample size by 5 as well as smoothing the effects of age misreporting), the trends are reasonably smooth, and urban-rural differentials in m are in the expected direction. This pattern is illustrated in the lower panel of Figure 10. The lower panel shows that the urban m substantially exceeds the rural m, indicating a greater degree of marital fertility control in urban than in rural areas. The only irregularity in the lower panel is the relatively high value of m for the estate sector in 1966-70. It is note-worthy that in all residence categories m was already above 0.5 at the start of our estimation period in 1966, indicating that by that time diffusion of the practice of family limitation was already well underway in all residence categories.

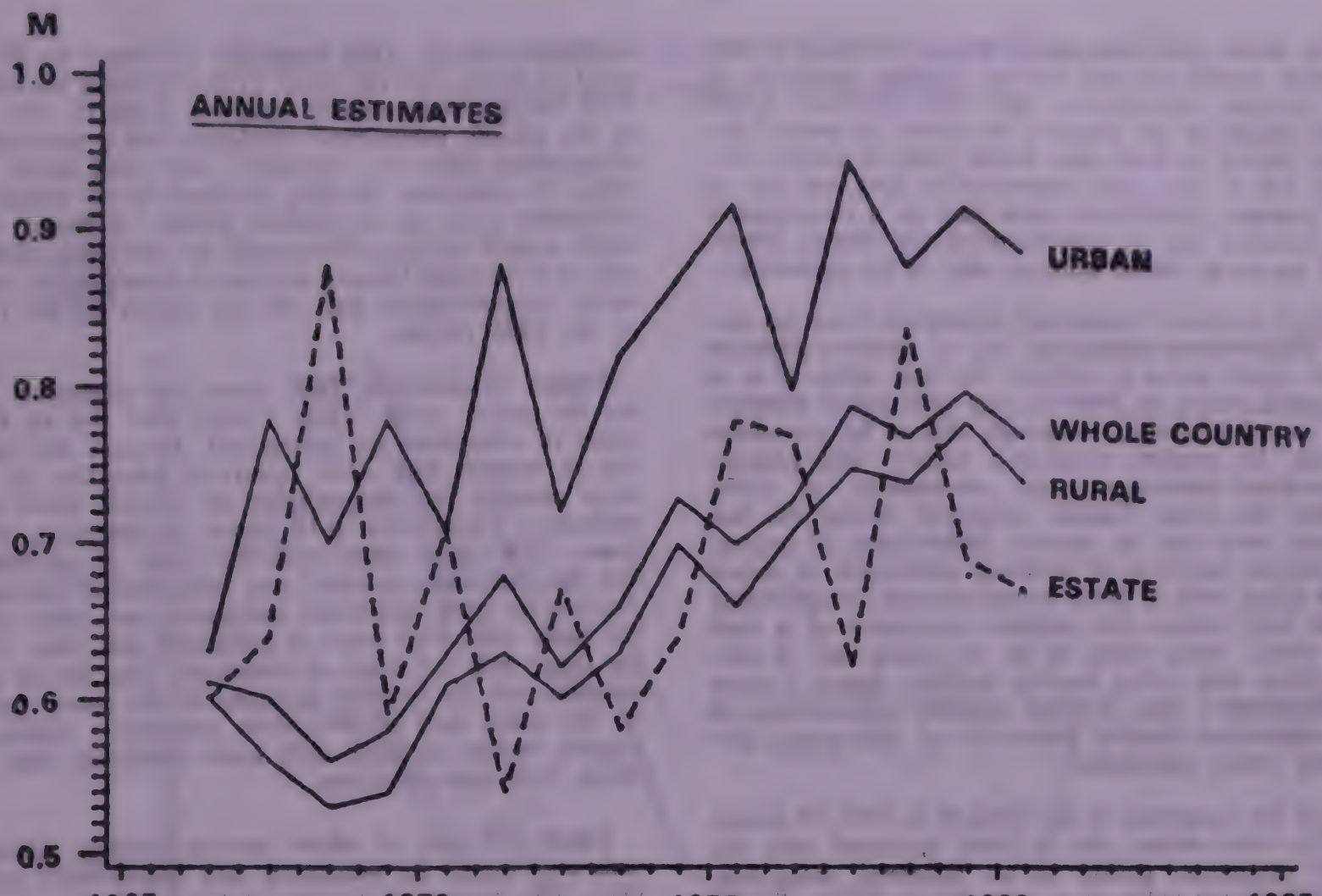
The high value of m in the estate sector is somewhat surprising, but for the 1976-80 period it is consistent with contraceptive use estimates from the 1975 World Fertility Survey in Sri Lanka, according to which 22 per cent of ever-married women of reproductive age in the estate sector had ever used contraception in 1975. Comparable percentages for rural as a whole and for urban are 44 and 53 per cent, respectively.[21] It is interesting that although the extent of contraceptive use is considerably lower in the estate sector than in the rural sector as a whole, this difference is not reflected in the m index. The lower panel of Figure 10 shows m values for rural and estate that are rather similar, with estate actually exceeding overall rural for the earliest 5-year period. This discrepancy may stem partly from differences in the age pattern of contraceptive use. World Fertility Survey results show that contraceptive use among estate Tamils was much more concentrated at the older ages and longer marital durations than was the case among other ethnic groups, which tended to use contraception for spacing as well as limiting purposes.[22] Since the m index is sensitive to marital fertility differences between the younger and older reproductive ages, regardless of the origin of these differences, these differences in the age pattern of contraceptive use could account, at least in part, for the relatively high value of m in the estate sector.

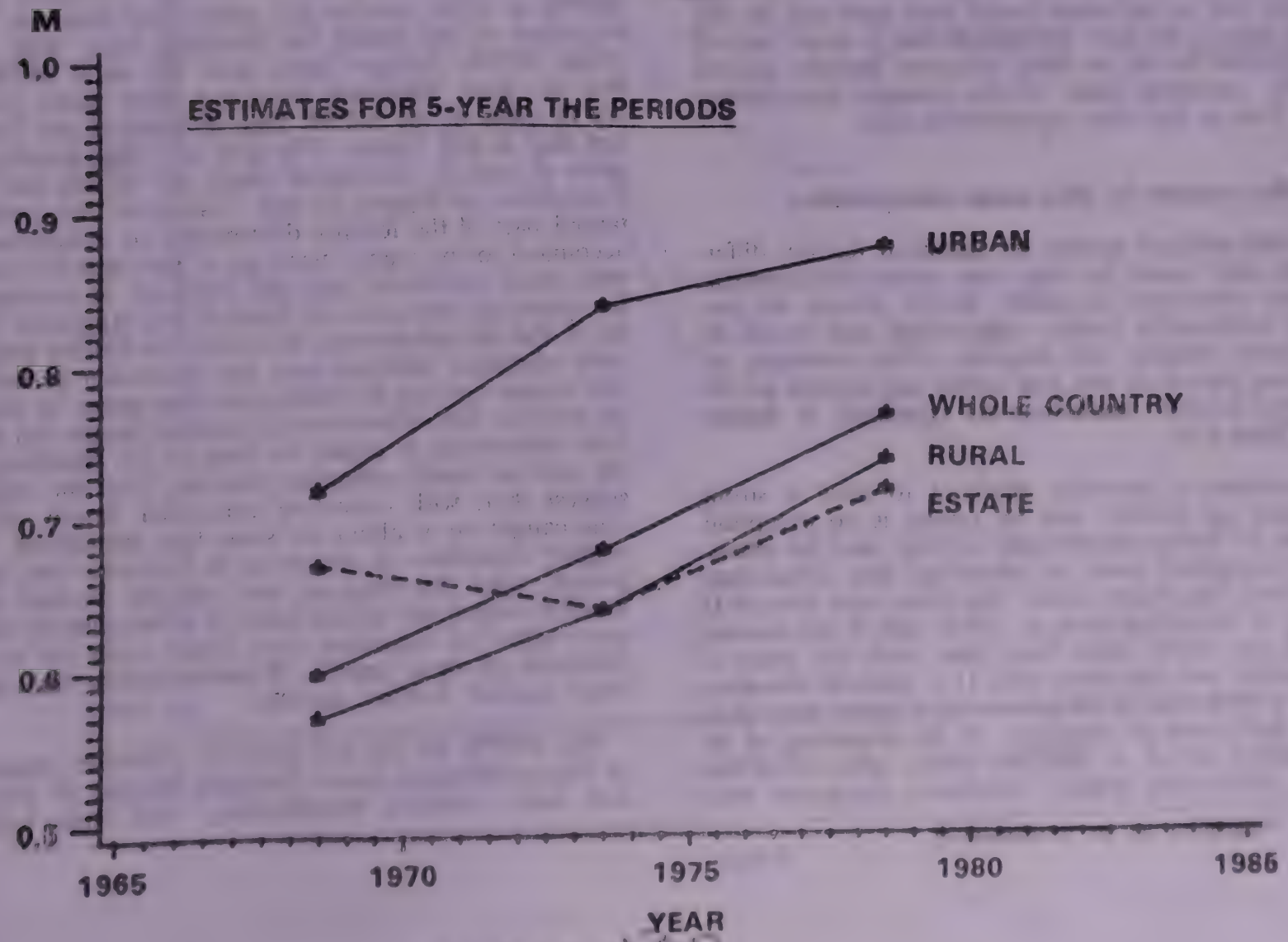
A possible reason for the rising value of m in the estate sector after 1975, despite marital fertility increase during the same period, relates to the breastfeeding hypothesis mentioned earlier. If a trend toward shorter breastfeeding exists and is concentrated among younger women, then marital fertility will be rising at the younger ages and may more than offset any reductions at the older ages due to increased contraceptive use. (Recall the concentration of marital fertility increases at the younger reproductive ages in the estate sector in Figure 9). The m

[21] Sri Lanka Department of Census and Statistics, *World Fertility Survey, Sri Lanka, 1975, First Report, op. cit.* in footnote 9, p. 87.

[22] Langford, *op. cit.* in footnote 11, Table 8.

Figure 10 : Trends in the m index of marital fertility control by urban-rural residence





DEM-130

index would then rise, partly because reduced breastfeeding would increase marital fertility especially at the younger reproductive ages and therefore would have effects on the shape of the curve of marital fertility similar to those that would occur if marital fertility fell at the older reproductive ages but not at the younger reproductive ages (say as a consequence of increased use of contraception for family limitation purposes, which appears also to be occurring).

If the previously mentioned hypothesis (from an earlier study) about substantial use of induced abortion in the estate sector is correct,[24] the high value of m in the estate sector in 1966-70 may also reflect substantial use of abortion, although this is by no means certain, for reasons mentioned earlier. The practice of terminal abstinence, not uncommon in India whence the estate Tamils migrated during the last century, may also be present. Substitution of contraception for abortion or terminal abstinence in recent years along with a trend toward shorter breastfeeding could help explain the unusual coexistence of a high and slowly rising value of m, increasing use of contraception, and rising marital fertility. Again it must be emphasized that all these possible explanations of the anomolous fertility behaviour of the estate sector are rather speculative.

With the exception of the 1966-70 to 1971-75 period for the estate sector, the m index increased over the entire estimation period in all residence categories. By 1976-80 the value of m was .89 for urban, .74 for rural, and .72 for estate. In urban and in rural as a whole, the increases in m were associated with fertility decline, but in the estate sector they were not. In the estate sector, we have speculated that a large part of the increase in the m index occurred because marital fertility increased more at the younger reproductive ages than at the older reproductive ages.

Fertility estimates by other social characteristics

In the previous section we examined fertility differentials and trends by only one social characteristic, namely urban-rural residence. In this section we examine additionally fertility differentials and trends by education, religion and ethnicity. (Only summary results are shown in the text tables and figures in this section; detailed tabulations are contained in Appendix Tables 1-9).

Education is normally observed to have a strong influence on fertility, and Sri Lanka is no exception. Figure 11 shows annual total fertility rates by education (completed years of schooling) and urban-rural residence. The figure shows that those who have 6-10 years of education have a TFR that is on average about one child lower than those with 0-5 years of education, and that those with 11+ years of education have a TFR that is about one child lower than those with 6-10 years of education. At the beginning of the estimation period, in the late 1960s, urban-rural fertility differentials within education categories were negligible, but by 1980 they had increased to half a child or more, with the rural TFR exceeding the urban TFR in each educational category. Thus by the end of the period, urban-rural residence had a substantial independent effect on fertility, over and above the effect of education. Fertility declined in all education categories over the estimation period. Although one might expect fertility differentials by education ultimately to reconverge toward the end of demographic transition, reconvergence had not yet begun by the time of the 1981 census.

Figure 12 considers TFR trends by education just for the estate sector. Only those with 0-5 or 6-10 years of education are considered, because the number of women with 11+ years of education is not large enough for computation of reliable birth rate estimates. Those with 6-10 years of education have lower TFRs than those with 0-5 years of education, but the difference is small and occasionally reversed. Fertility in both education categories rose after 1973 for those with 6-10 years of education and after 1974 for those with 0-5 years of education. The factors responsible for the fertility increase in the estate sector in the latter half of the 1970s apparently impinged slightly earlier on those with more education than on those with less education.

Figure 13 and 14 show martial fertility differentials and trends by education and urban-rural residence. The pattern in Figure 13 for currently married women is rather similar to that in Table 11 for all women, in that for each education category the MTFR is rather similar for urban and rural at the beginning of the period but divergent later, with the urban MTFR falling more than the rural MTFR. But the three education categories show more overlap in levels of the MTFR than in levels of the TFR, and that is why Figure 13 is split into three panels, in order to visually distinguish easily the various curves. Comparison of Figures 11 and 13 suggests that a substantial part of the fertility differentials by education is accounted for by higher mean age at marriage for those with more education, and this inference is confirmed by nuptiality data given in Table 6 and Appendix Table 3. But the urban-rural divergence in fertility within each education category over the estimation period is due almost entirely to urban-rural divergence in marital fertility. The urban-rural divergence in marital fertility commences at about the time of the founding of the national family planning program. Thus the results suggest that, with education controlled, family planning caught on at about the same time throughout the country regardless of education or residence (not surprising, since the program very quickly became national in scope) but spread faster in urban than in rural areas (also not surprising since urban areas are more advanced on those aspects of modernization that promote marital fertility decline).

The MTFR for the 0-5 years of education category in Figure 13 starts lower (perhaps because of longer and more intensive breastfeeding) and ends higher

[24] Langford, *op. cit.* in footnote 11.

Figure 11 : Annual total fertility rates by completed years of education and urban-rural residence

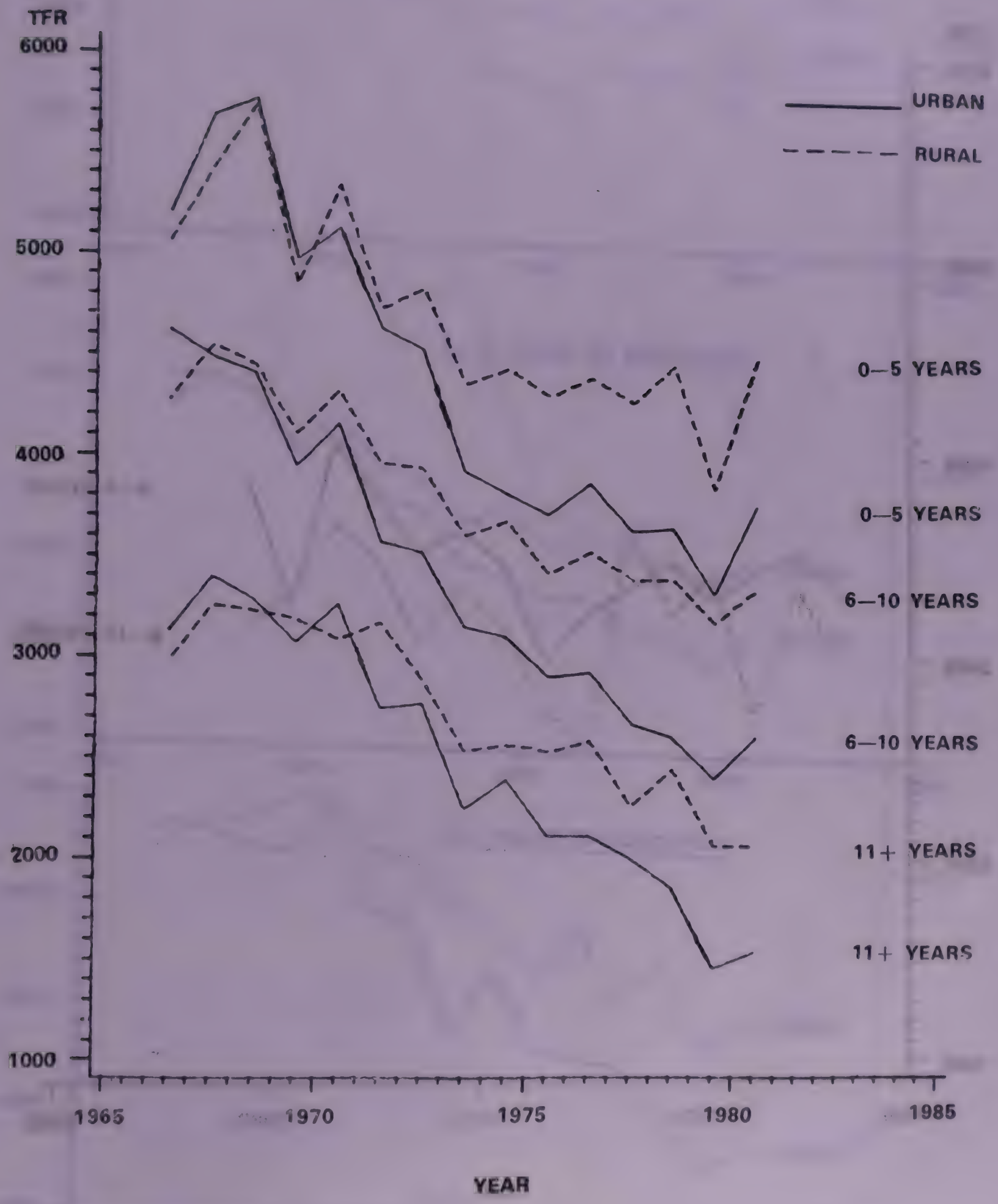


Figure 12 : Annual total fertility rates by completed years of education : estate only

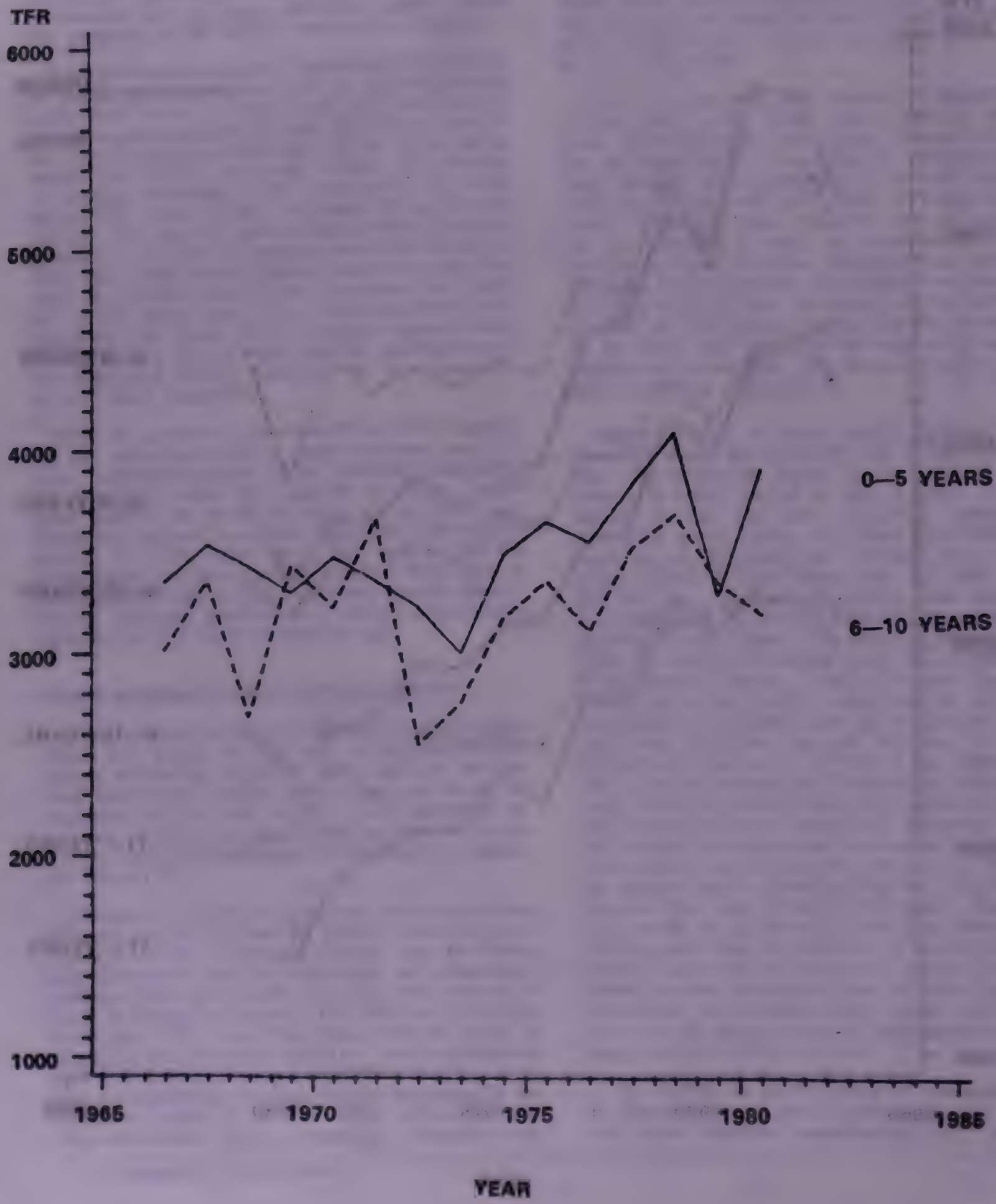


Figure 13 : Annual marital total fertility rates by completed years of education and urban-rural residence

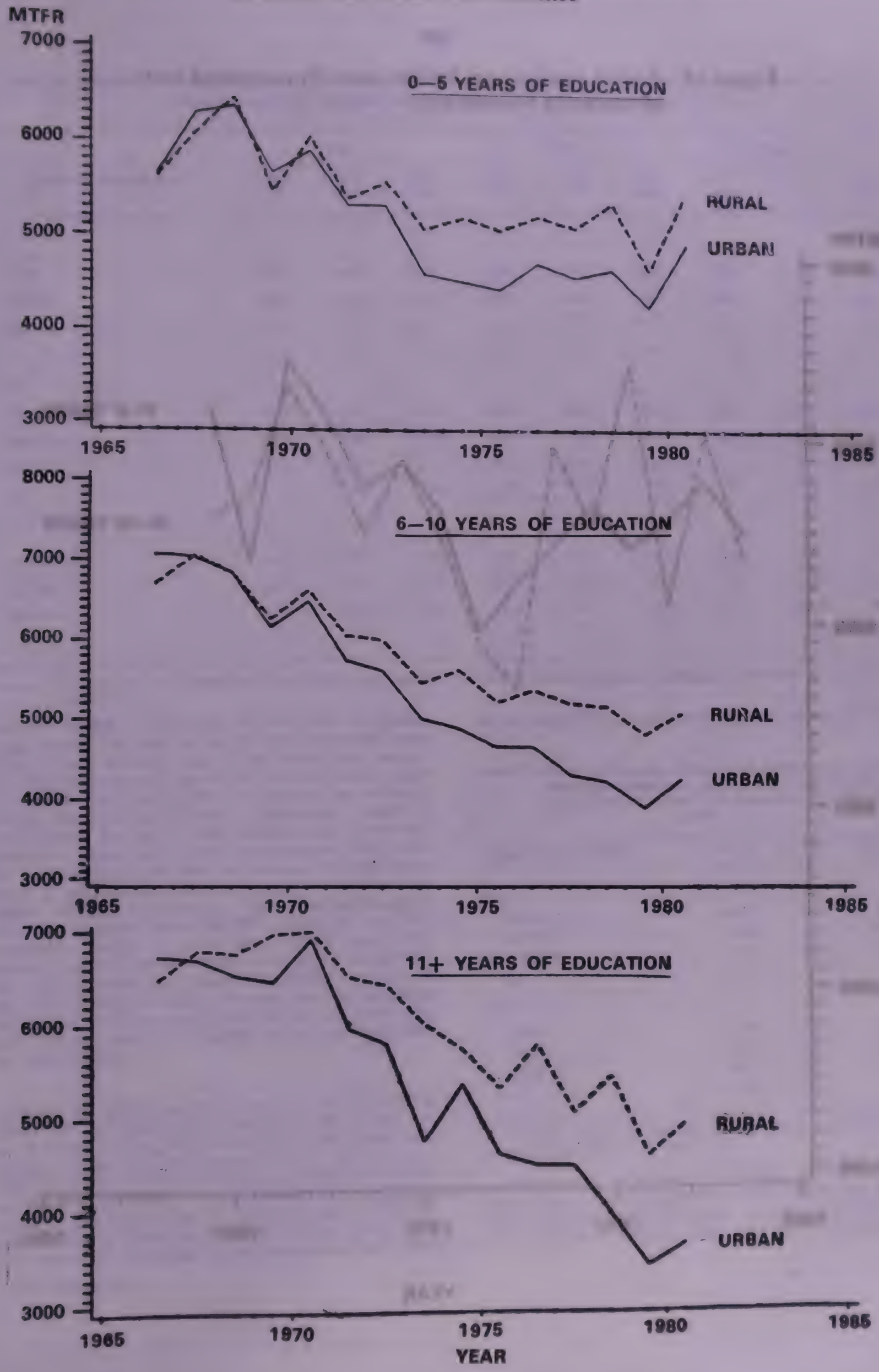


Figure 14 : Annual marital total fertility rates by completed years of education : estate only

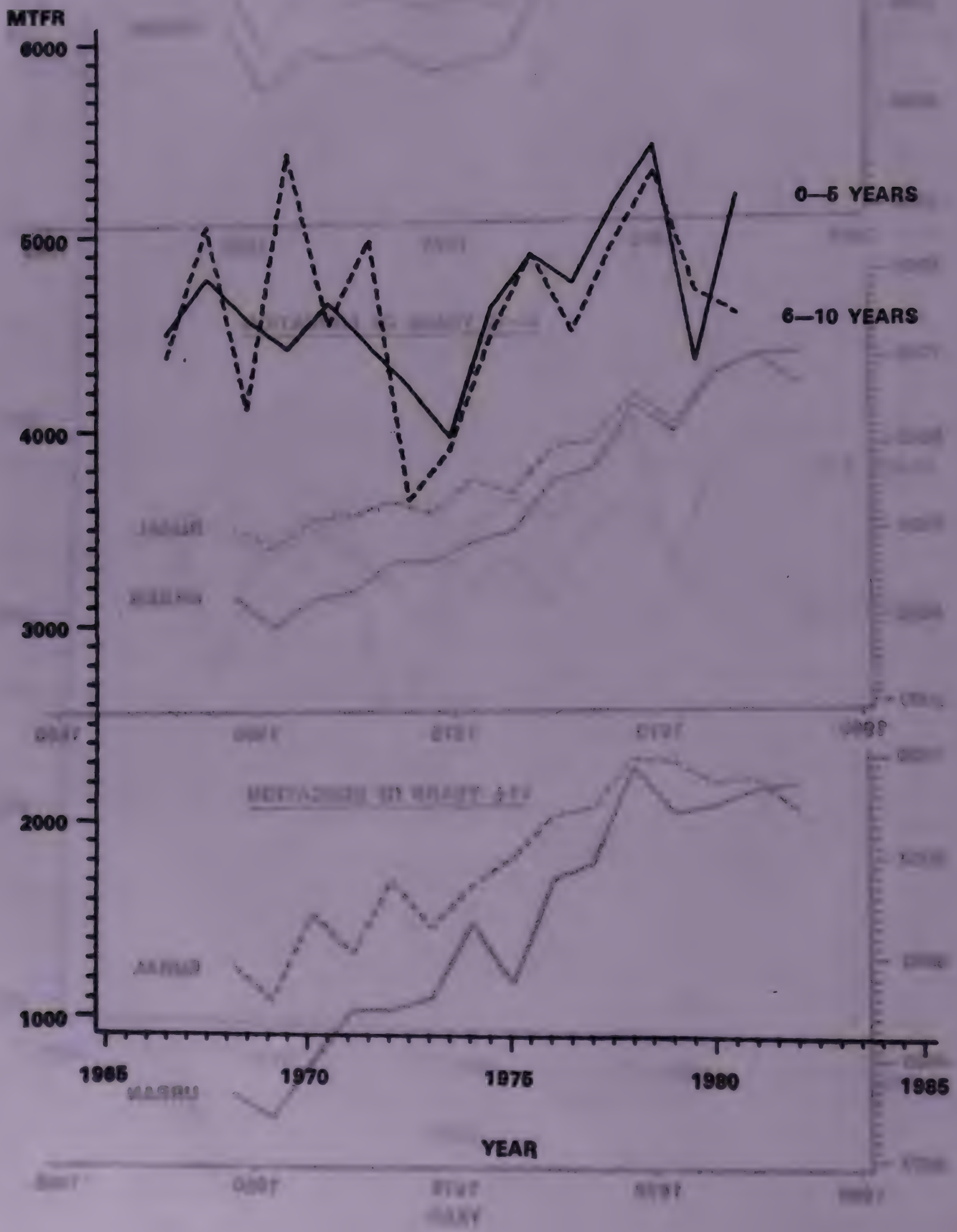


Table 6 : Total fertility rates, marital total fertility rates, singulate mean age at marriage, and values of the m index of marital fertility control by completed years of education and urban-rural residence

Education and measure	Total			Urban			Rural		
	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80
0—5									
TFR	5328	4487	4215	5355	4118	3644	5285	4529	4291
MTFR	5992	5218	5115	5986	4828	4628	5944	5257	5170
SMAM	21.4	21.7	22.1	21.2	21.8	22.4	21.5	21.8	22.0
m	.56	.66	.74	.70	.79	.83	.54	.64	.73
6—10									
TFR	4269	3538	3146	4306	3227	2632	4332	3697	3358
MTFR	6612	5466	4870	6688	5148	4255	6682	5639	5113
SMAM	25.0	25.1	25.1	24.8	25.2	25.5	25.1	25.1	25.0
m	.75	.80	.86	.83	.95	.97	.71	.74	.81
11+									
TFR	3007	2556	2033	3219	2424	1762	3140	2716	2256
MTFR	6521	5567	4604	6533	5252	3954	6316	5246	5123
SMAM	27.6	28.3	28.9	26.6	27.4	28.3	28.3	28.8	29.3
m	.69	.63	.76	.78	.72	.90	.66	.58	.68

Note : Detailed age-specific birth rates and proportions currently married by completed years of education are shown in Appendix, Tables 1-3

than the MTFR in either the 6-10 or 11+ categories. Thus the MTFR decline for the 0-5 education category is more gradual than in the other two categories. The reasons for this more gradual decline may have partly to do with differentials in the use of birth control for spacing purposes. Appendix Table 2, which shows age-specific marital birth rate trends by education, shows that marital birth rates at the younger reproductive ages did not decline by nearly as much in the lowest education category as in the two higher education categories. This finding suggests that the relatively slow MTFR decline in the 0-5 education category is partly due to birth control for spacing not yet having caught on among those with the least education. In Figure 13, MTFRs in the 6-10 and 11+ education categories start and end at about the same level in the case of rural, but for urban the 11+ category ends at a slightly lower level than does the 6-10 category.

Figure 14, which parallels Figure 12, shows MTFR trends for the estate sector, in which the trends for the 0-5 and 6-10 education categories are again very similar. Comparison of Figures 12 and 14 indicates that the slight TFR differentials by education in the estate sector in Figure 12 are accounted for by differentials in age at marriage by education, not by MTFR differentials by education. On the estates, those with 6-10 years of education marry somewhat later than those with 0-5 years of education, as shown in Table 7.

Table 7 : Total fertility rates, marital total fertility rates, singulate mean age at marriage, and values of the m index of marital fertility control by education for the estate sector

Education and measure	1966-70	1971-75	1976-80
0—5			
TFR	3417	3347	3726
MTFR	4590	4456	5011
SMAM	23.6	23.5	23.4
m	.74	.65	.71
6—10			
TFR	3149	3095	3367
MTFR	4715	4418	4849
SMAM	24.5	24.4	24.4
m	.65	1.07	.91

Note.—The 11+ education category is omitted because of an insufficient number of cases.

Interestingly, in Figure 13 MTFR decline for the country as a whole appears to have begun 4-5 years earlier for the 6-10 education category than for the 11+ education category. This may have occurred be-

cause the 11+ category marries especially late—on average about 28 or 29 years of age, which is 3-4 years later than the 6-10 education category—as shown in Table 6. Insofar as there are trade-offs between delayed marriage and contraception as a means for limiting family size, extremely late marriage may have delayed the onset of marital fertility decline in the 11+ education category, though not by very much.[25] Table 6 shows that age at marriage rose only slightly in each of the education categories, though slightly more so in the 11+ education category than in either the 0-5 or 6-10 categories. The somewhat greater marriage response in the 11+ category adds further support to the hypothesis that trade-offs between delayed marriage and contraceptive use may have been occurring. It is evident from these tables and figures that TFR declines within education-residence categories were due primarily to marital fertility decline, not to rising age at marriage. Likewise, in the estate sector, TFR increases within education-residence categories were due primarily to marital fertility increases, not to falling age at marriage. Note again the contrast with the fertility decline that occurred in Sri Lanka in the decade or so before 1966, which was due almost entirely to rising age at marriage.[26]

Table 6 also shows trends in the m index of marital fertility control by education and urban-rural residence; values by education for the whole country are also graphed in Figure 15. Within education categories, urban m's are consistently higher than rural m's, again indicating that residence has effects independent of those of education. Interestingly, the 6-10 education category shows a higher m than the 11+ category, which supports the hypothesis that adoption of contraception may have been delayed somewhat in the 11 + education category due to unusually late marriage. However, although adoption of contraception may indeed have been delayed somewhat, direct estimates of contraceptive use by education from the 1975 World Fertility Survey in Sri Lanka show that by 1975 those with 10+ years of education had substantially higher contraceptive use rates than those with either 0-5 or 6-0 years of education.[27] Thus the relatively low value of m for the 11+ education category for 1976-80 in our data (Table 6) appears inconsistent with direct information on contraceptive use and may be due to more use of contraception for spacing (as well as for limiting) in the 11+ education category than in the 6-10 education category. As indicated earlier, birth control for spacing tends to flatten the age curve of marital fertility, making it less concave-upward at the older reproductive ages than it would otherwise be and thereby possibly reducing the value of m. Here again we see the need for considerable caution in interpreting differences in the value of m among groups and over time.

Table 7 shows TFRs, MTFRs, SMAMs, and values of m for the estate sector for grouped time periods. Except for the earliest period, 1966-70, the education differentials in m are in the expected direction. However, there is no comparison between the 6-10 and 11+ education categories, since the 11+ categories lacks sufficient cases for reliable estimates of m.

Figures 16 and 17 show annual total fertility rates and marital total fertility rates by region. In Figure 16, pertaining to all women, Muslims have the highest total fertility and Christians the lowest, with Buddhists and Hindus in between. At the beginning of the estimation period, Buddhist fertility exceeded Hindu fertility, but by the end of the period the reverse was true. The reversal occurred because Hindu fertility fell very little, whereas Buddhist fertility fell more substantially.

Figure 17, pertaining to currently married women, shows a somewhat different pattern than Figure 16, as a consequence of religious differentials in age at marriage that are shown in Table 8 and Appendix Table 6. Most striking in Figure 17 is the similarity in marital fertility level and trend between Buddhists and Muslims. Both groups had an MTFR of about 6.5 per woman in 1966, declining to somewhat over 5 by 1981. Buddhist marital fertility fell slightly more than Muslim marital fertility, but not by very much. Table 8 shows that the cause of higher Muslim than Buddhist TFRs in Figure 16 was that age at marriage was about 2-3 years lower for Muslims than for Buddhists. Table 8 and Figure 17 show also that Hindu marital fertility fell little over the estimation period, except in urban areas, where age at marriage and m both rose sharply; thus the MTFR for urban Hindus fell by about one child per woman and the TFR by about 1.7 children per women. Whereas martial fertility hardly fell at all for Hindus as a whole, it fell substantially for all other religious groups. Therefore, although Hindus had the lowest MTFR of any religious group at the beginning of the estimation period in Figure 17, they had the highest MTFR by the end of the period. Christians had both a late age at marriage (about the same as Buddhists) and the highest degree of marital fertility control of any religious group (as indicated by m in Table 8), so that Christians have both the lowest MTFRs and the lowest TFRs of any religious group in Figures 16 and 17.[28]

---

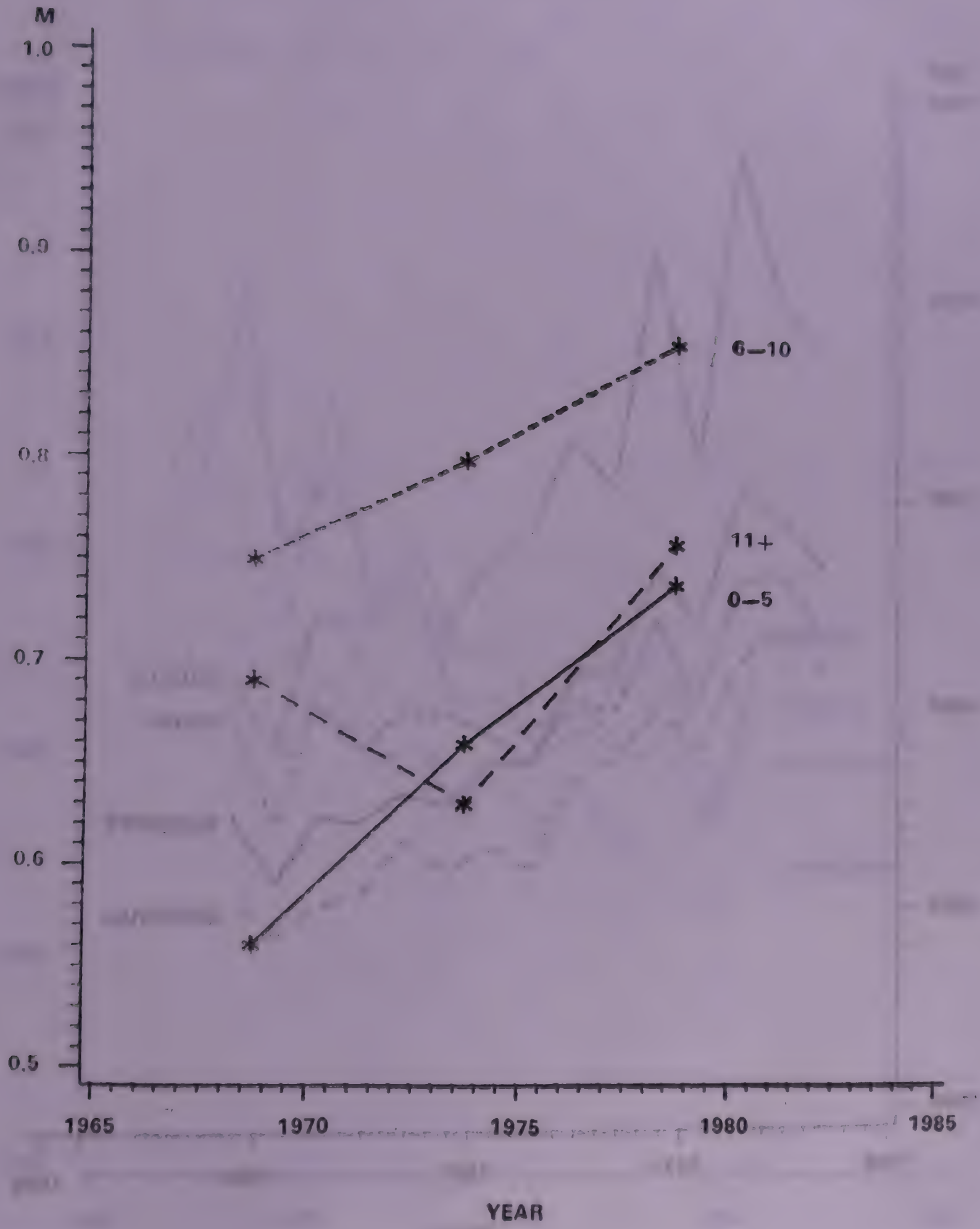
[25]For more in-depth discussions of such trade-offs, *See* K. Davis, "The Theory of Change and Response in Modern Demographic History," *Population Index* 29 (1963): 345-366; and P. Demeny, "Early Fertility Decline in Austria-Hungary: A Lesson in Demographic Transition," in D.V. Glass and R. Revelle (eds.), *Population and Social Change* (London: Edward Arnold), pp. 153-172.

[26]Wright, *loc. cit.* in footnote 18.

[27]Sri Lanka Department of Census and Statistics, *World Fertility Survey, Sri Lanka, 1975, First Report, op. cit.* in footnote 9 p. 87.

[28]In the case of Christians especially, we see evidence of a "multiphasic response" that includes both delayed marriage and adoption of contraception. Earlier, in regard to fertility differentials by education, we noted the possibility of trade-offs between these responses. The two effects (tradeoffs and multiphasic response) are not incompatible. Within the multiphasic response, some responses may be more emphasized than others as a result of tradeoffs. *See* K. Davis, *loc. cit.* in footnote 25.

Figure 15 : Trends in the m index of marital fertility control by education : whole country



Source : Estimates for 5-year time periods in Table 6.

Figure 16 : Annual total fertility rates by religion - whole country

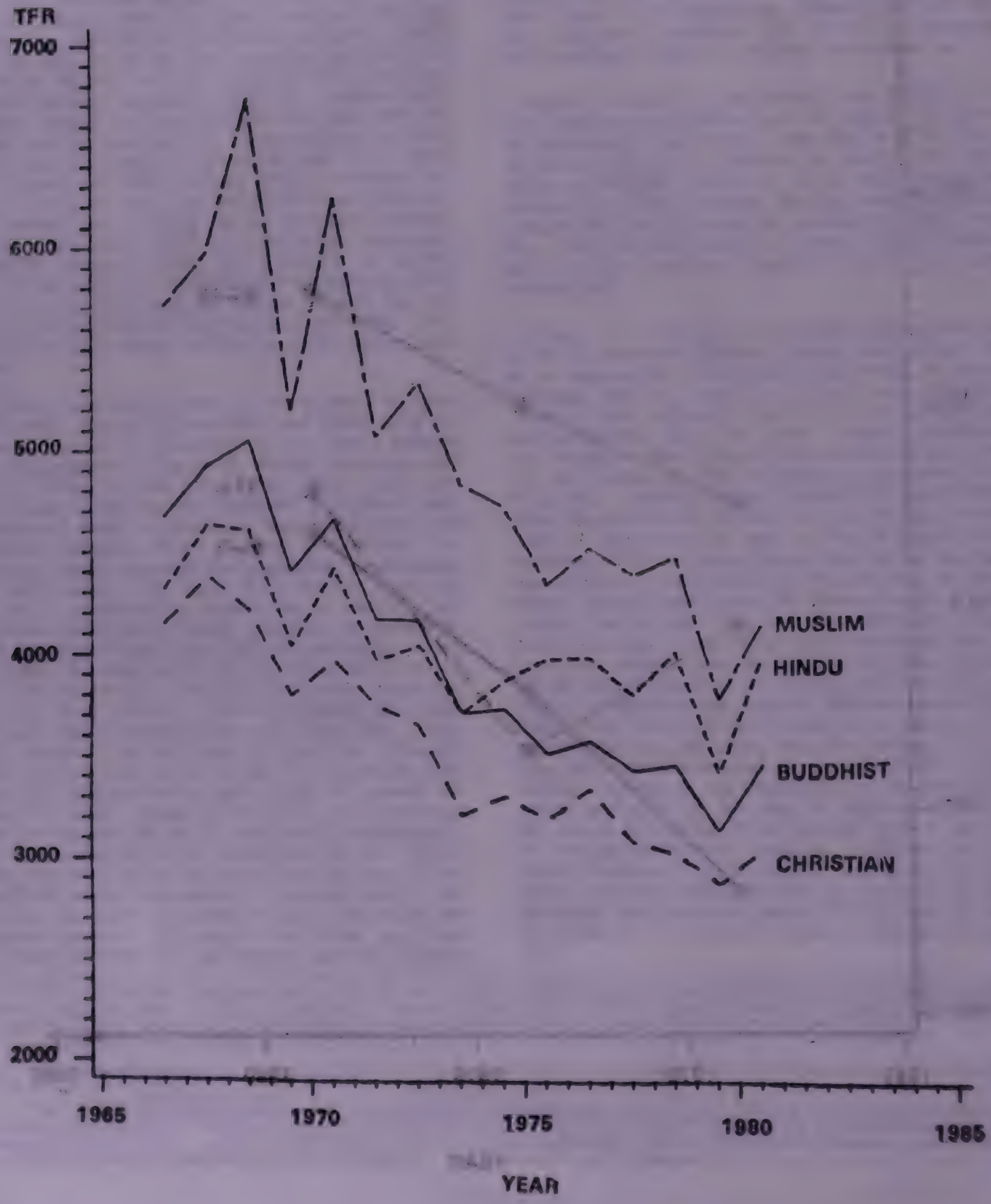


Figure 17 : Annual marital total fertility rates by religion : whole country

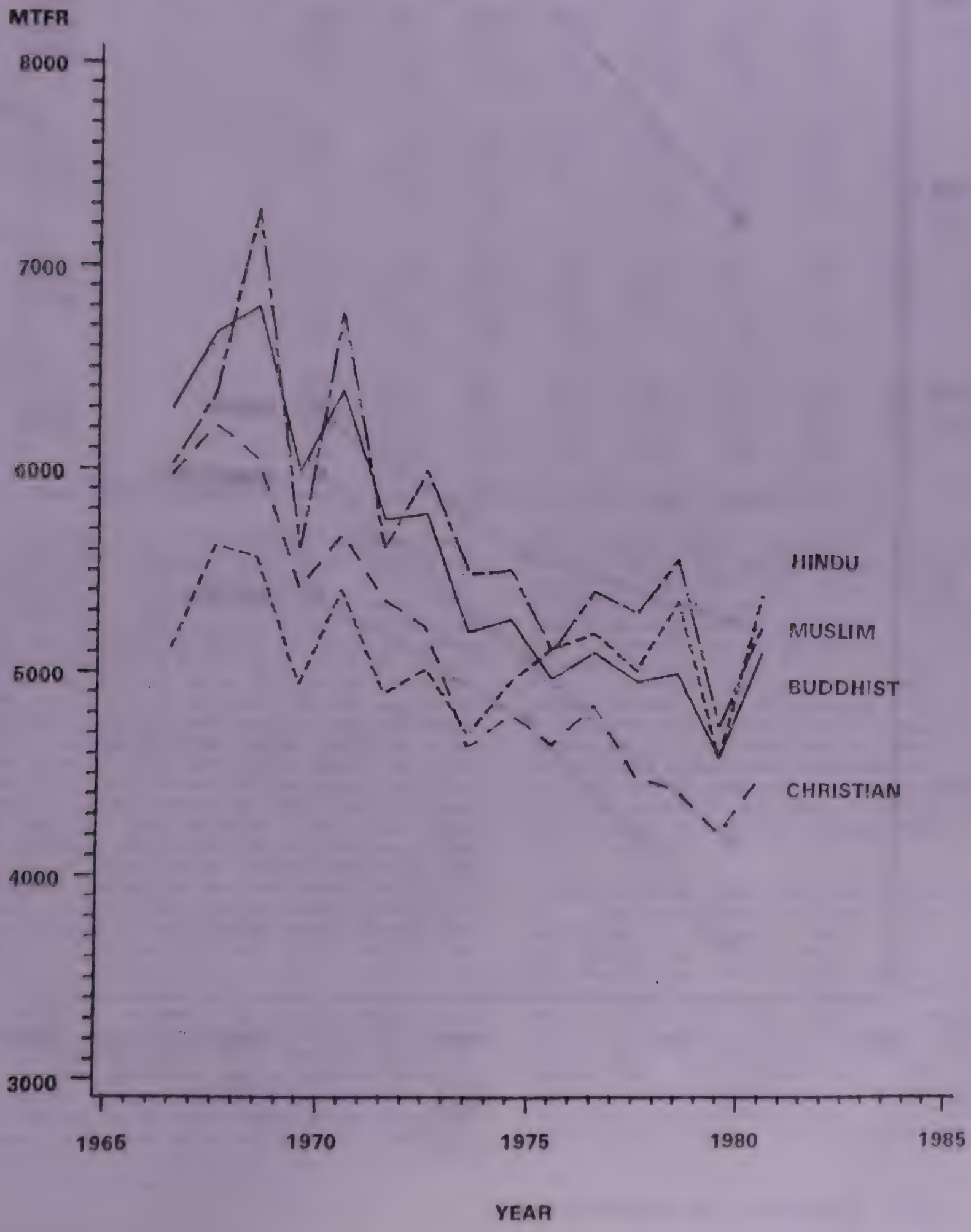
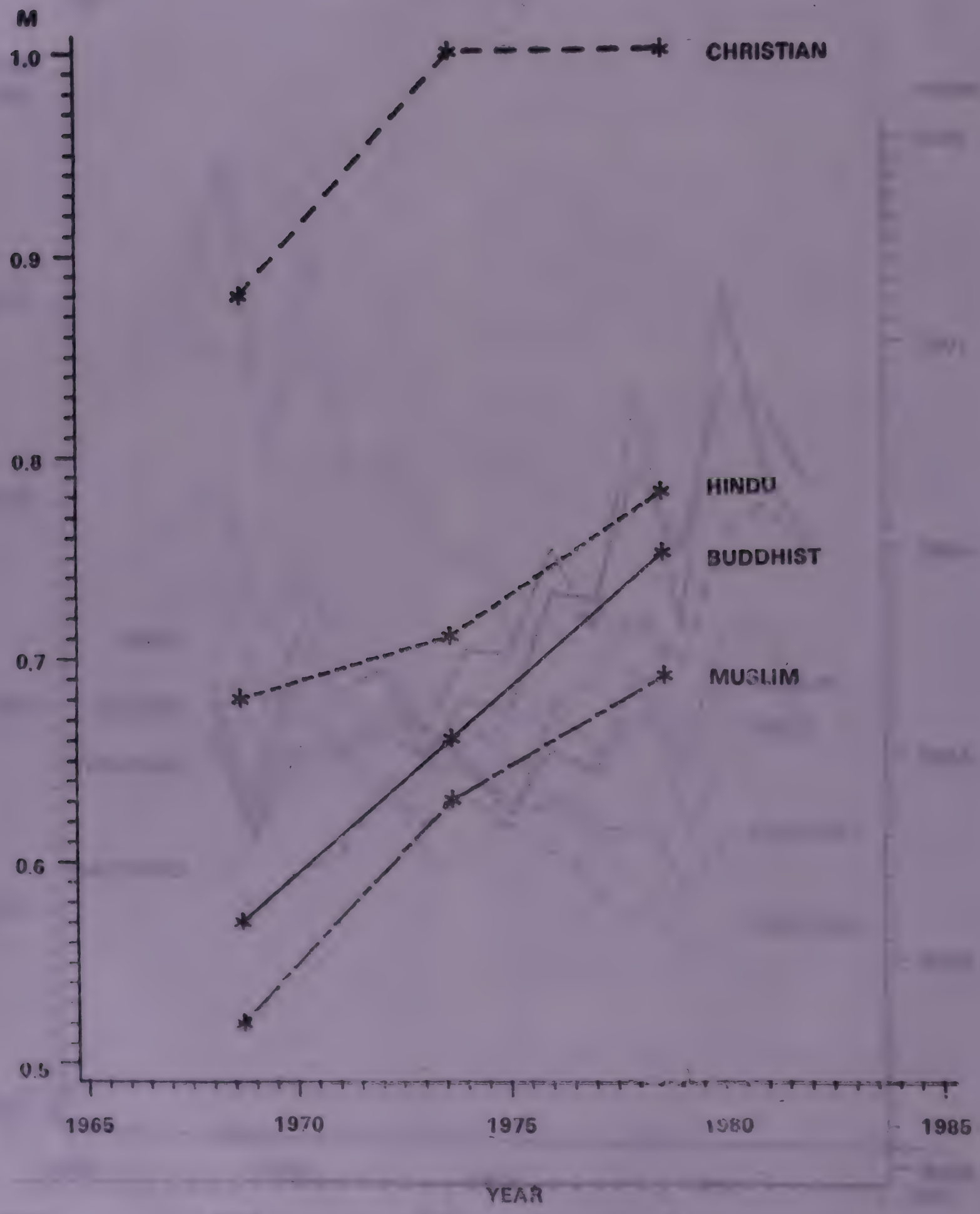


Figure 18 : Trends in the m index of marital fertility control by religion : whole country



Source : Estimates for 5—year time periods in Table 8.

Table 8 : Total fertility rates, marital total fertility rates, singulate mean age at marriage, and values of the m index of marital fertility control by religion and urban-rural residence

Religion and measure	Total			Urban			Rural		
	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80
Buddhist									
TFR	4742	3845	3410	4161	3088	2519	4823	3983	3580
MTFR	6426	5387	4961	6141	4780	4065	6429	5476	5103
SMAM	23.6	24.1	24.5	24.1	24.8	25.5	23.5	23.9	24.3
m	.57	.66	.75	.68	.80	.86	.55	.63	.74
Hindu									
TFR	4402	3912	3836	4884	3748	3172	4289	3957	4012
MTFR	5326	4939	5120	5861	4962	4649	5204	4938	5230
SMAM	22.4	22.9	23.4	22.2	23.3	24.5	22.4	22.8	23.2
m	.68	.71	.78	.70	.80	.96	.67	.68	.75
Muslim									
TFR	5975	4836	4249	5940	4435	3782	6290	5296	4752
MTFR	6412	5534	5254	6956	5489	5016	6340	5740	5586
SMAM	20.4	21.3	22.2	21.7	22.5	23.2	19.3	20.4	21.5
m	.52	.63	.69	.59	.69	.70	.47	.59	.67
Christian									
TFR	4099	3410	3073	4297	3207	2658	4154	3694	3533
MTFR	5858	4920	4492	6534	5052	4343	5628	4958	4729
SMAM	23.9	24.0	24.2	24.0	24.6	25.2	23.7	23.5	23.3
m	.88	1.00	1.00	.92	1.08	1.09	.86	.93	.94

Note.—Detailed age-specific birth rates and proportions currently married are shown in Appendix, Tables 4-6.

The trends in m for the different religious groups are given by urban-rural residence in Table 8 and also graphed for the whole country in Figure 18. Table 8 shows that within religious groups, fertility is lower and m higher in urban than in rural areas, with the exception of Hindus, for whom the urban-rural differentials in fertility (but not m) are reversed during the first half or so of the estimation period. The reversal for Hindus during the first part of the period has little to do with age at marriage and occurs mainly because of higher marital fertility in urban than in rural areas, perhaps due mainly to shorter and less intensive breastfeeding in urban areas. Two aspects of the m values for the whole country in Figure 18 stand out. First, the value of m is much higher for Christians than for the other religious groups. And second, the value of m for Hindus is higher than that for either Buddhists or Muslims, despite the fact that Hindu marital fertility, though comparatively low at the beginning of the estimation period, changed little and ended comparatively high by the end of the period.

Part of the reason for the high and rising m for Hindus is apparent in Appendix Table 5, which shows that age-specific marital birth rates for Hindus fell at the older reproductive ages but remained steady or rose at the younger reproductive ages (excluding 15-19), whereas for the other religious groups age-specific marital birth rates fell at all ages. As mentioned earlier, the adoption of contraception simultaneously for both limiting and spacing of births may cause m to rise less than would occur if contraception were adopted for limiting only, and this perhaps explains part of the high and rising value of m for Hindus. It is also possible that Hindus generally, and not just those on the estates, have been experiencing a sharp decline in breastfeeding, particularly among younger women, in recent years. As mentioned, such a change in the pattern of breastfeeding (which, it must again be emphasized, is hypothesized but not directly documented) could further elevate temporarily the value of m. Although the pattern of m values for Hindus is somewhat anomalous and difficult to explain, values of the m index are higher for Buddhists than for Muslims, as expected.

Figure 19 shows annual total fertility rates by ethnicity. The fertility trend for Moors is almost identical to that for Muslims in Figure 16, since in this case ethnicity and religion virtually coincide. Likewise, the trend for Tamils closely resembles the trend for Hindus, and the trend for Sinhalese closely resembles the trend for Buddhists. Moors have the highest fertility of any ethnic group throughout the estimation period. Of the two other groups, Sinhalese and Tamils, Sinhalese had higher fertility than Tamils at the beginning of the estimation period but lower at the end. This reversal occurred because Tamil fertility fell only slighty over the period, whereas Moor and

Figure 19 : Annual total fertility rates by ethnicity : whole country

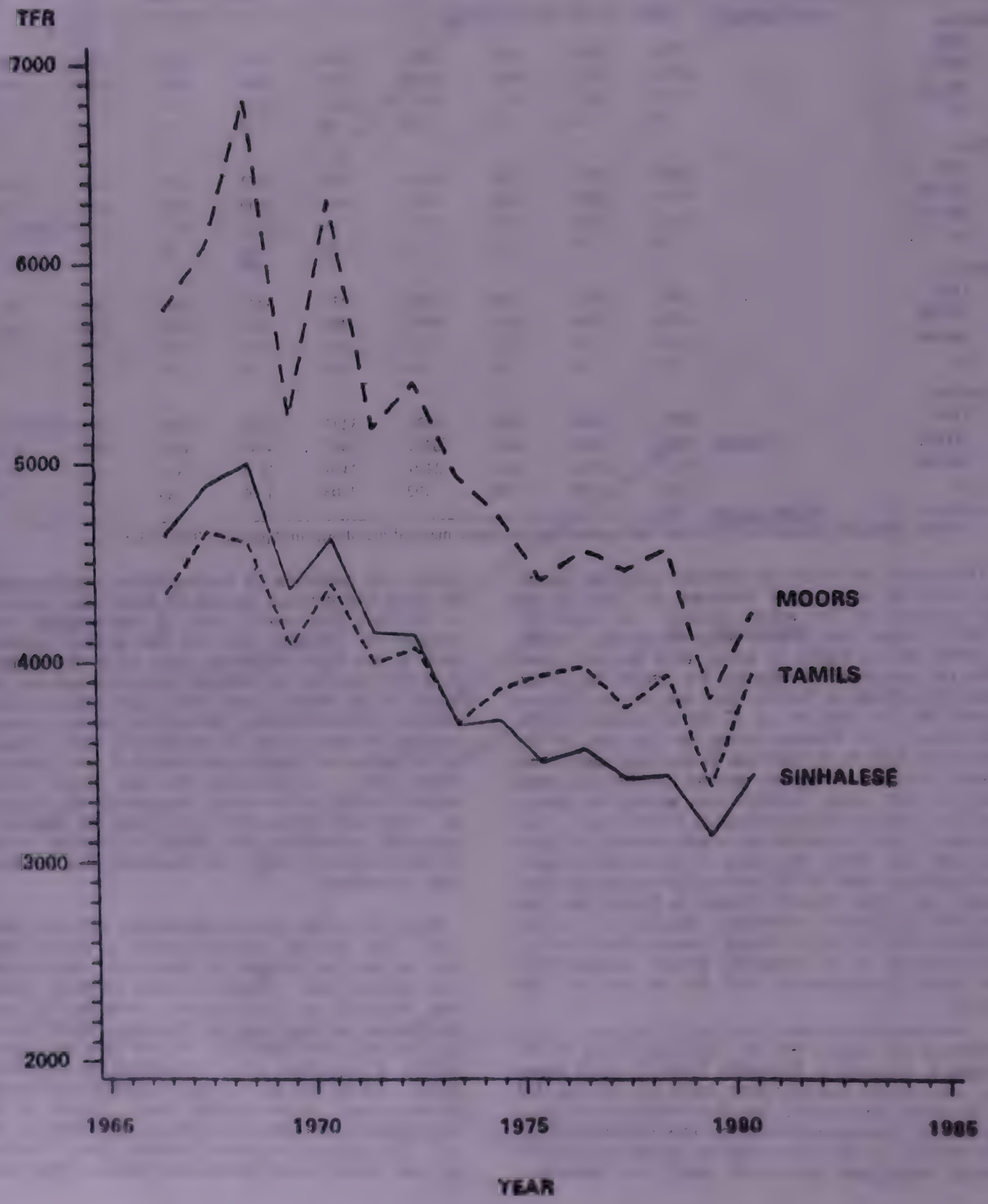


Figure 20 : Annual marital total fertility rates by ethnicity : whole country

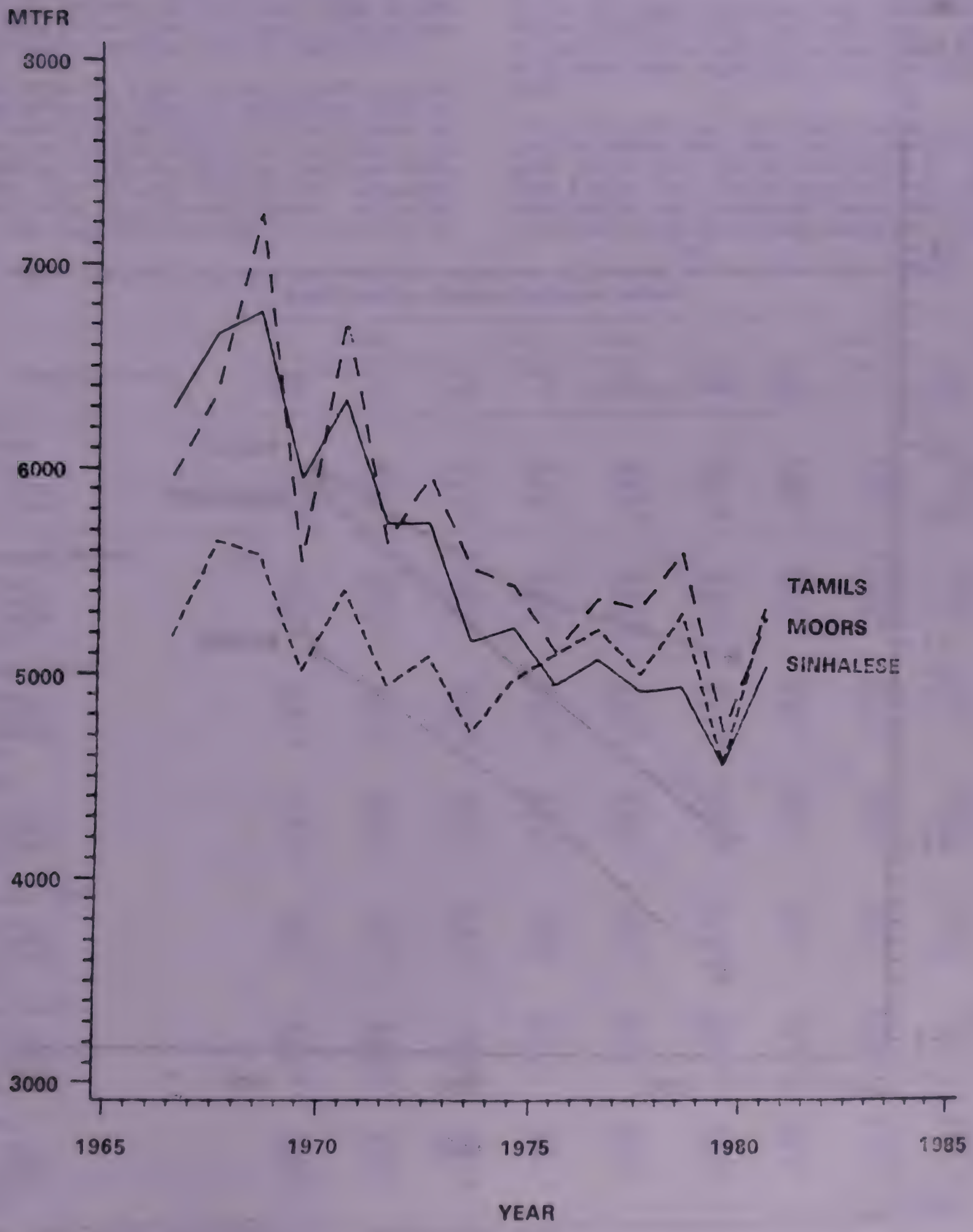
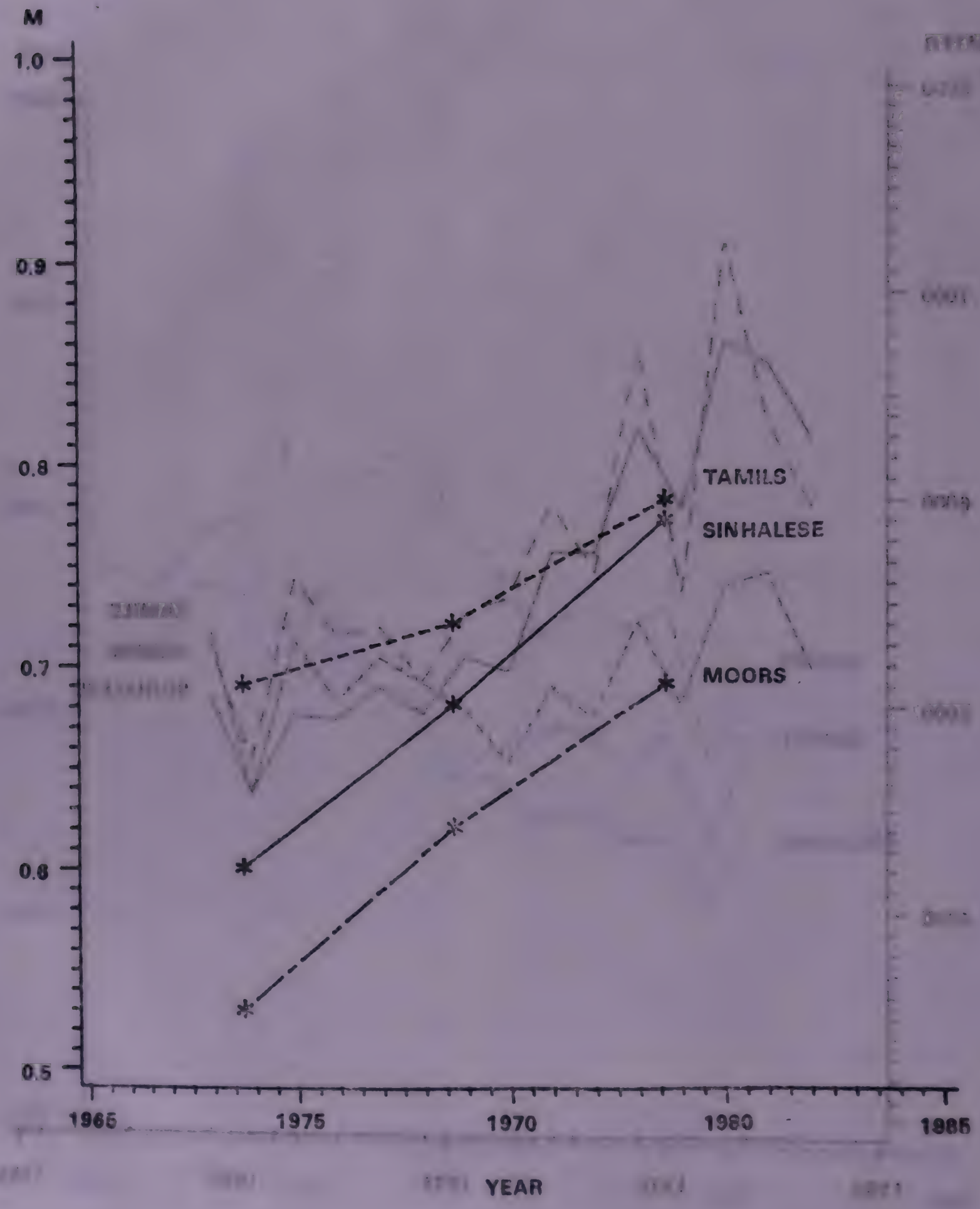


Figure 21 : Trends in the m index of marital fertility control by ethnicity : whole country



Source : Estimates for 5—year time periods in Table 9.

Sinhalese fertility fell more rapidly. Figure 20 shows annual marital total fertility rates by ethnicity. Again, Moors, Tamils, and Sinhalese in Figure 20 show similar trends to Muslims, Hindus, and Buddhists in Figure 17. Similarly, the three ethnic groups resemble the three religious groups in values of the m index as is seen by comparing Figure 21 with Figure 18.

Sinhalese and Tamils are each divisible into two major sub-groups. Figure 22, which shows TFRs for all women, elaborates Figure 19 by sub-dividing Sinhalese into Kandyan Sinhalese and Low Country Sinhalese, and Tamils into Sri Lanka Tamils and Indian Tamils. Low Country Sinhalese have substantially lower fertility than Kandyan Sinhalese, and fertility for both groups fell substantially over the period. At the beginning of the period, Sri Lanka Tamils had substantially higher fertility than Indian Tamils, but by the end of the period fertility for these two groups had converged. Convergence occurred because fertility for Sri Lanka Tamils fell, rather substantially whereas fertility for Indian Tamils rose slightly. This is consistent with the earlier finding that fertility rose in the estate sector, where Indian Tamils are concentrated.

Figure 23 shows that Low Country Sinhalese and Kandyan Sinhalese differ much less in their MTFR trends than in their TFR trends in Figure 22. As Table 9 shows, this is because part of the TFR difference between Low Country and Kandyan Sinhalese is accounted for by later marriage among Low Coun-

Table 9 : Total fertility rates, marital total fertility rates, singulate mean age at marriage, and values of the m index of marital fertility control by ethnicity and urban-rural residence

Ethnicity and measure	Total			Urban			Rural		
	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80
Sinhalese									
TFR	4690	3808	3378	4140	3086	2509	4793	3965	3574
MTFR	6404	5357	4917	6234	4841	4078	6406	5450	5078
SMAM	23.7	24.1	24.5	24.3	24.9	25.5	23.5	23.9	24.3
m	.60	.68	.77	.74	.86	.90	.57	.64	.75
Low-Country Sinhalese									
TFR	4265	3523	3136	4135	3118	2520	4349	3694	3392
MTFR	6286	5270	4792	6335	4934	4091	6321	5416	5066
SMAM	24.4	24.7	25.0	24.4	25.0	25.5	24.4	24.6	24.9
m	.66	.72	.80	.77	.88	.91	.63	.68	.76
Kandyan Sinhalese									
TFR	5292	4198	3696	4180	2914	2448	5280	4252	3755
MTFR	6541	5454	5059	5756	4352	4001	6479	5473	5080
SMAM	22.7	23.2	23.8	23.6	24.6	25.6	22.6	23.1	23.7
m	.50	.61	.73	.53	.74	.83	.49	.61	.73
Tamils									
TFR	4401	3896	3781	4881	3713	3160	4285	3967	3991
MTFR	5366	4969	5102	5998	5016	4720	5219	4977	5227
SMAM	22.5	23.0	23.5	22.4	23.5	24.5	22.5	22.8	23.2
m	.69	.72	.78	.74	.83	.95	.67	.69	.73
Sri Lanka Tamils									
TFR	4793	4140	3808	4872	3721	3157	4853	4396	4179
MTFR	5664	5209	5164	6127	5128	4761	5552	5299	5401
SMAM	22.0	22.8	23.6	22.7	23.7	24.6	21.6	22.4	23.1
m	.70	.76	.82	.78	.86	.96	.66	.72	.76
Indian Tamils									
TFR	3590	3398	3727	5037	3649	3221	3462	3355	3716
MTFR	4618	4401	4951	5674	4357	4462	4505	4371	4930
SMAM	23.1	23.2	23.2	21.5	22.1	22.6	23.2	23.2	23.2
m	.68	.61	.68	.53	.65	.88	.69	.62	.68
Moors									
TFR	6034	4892	4297	6005	4494	3828	6327	5324	4773
MTFR	6382	5530	5270	6886	5469	5018	6342	5741	5596
SMAM	20.2	21.2	22.1	21.5	22.3	23.0	19.2	20.3	21.4
m	.53	.62	.69	.62	.67	.71	.48	.58	.67

Note.—Detailed age-specific birth rates and proportions currently married by ethnicity are shown in Appendix, Tables 7—9.

Figure 22 : Annual total fertility rates for Sinhalese and Tamils : whole country

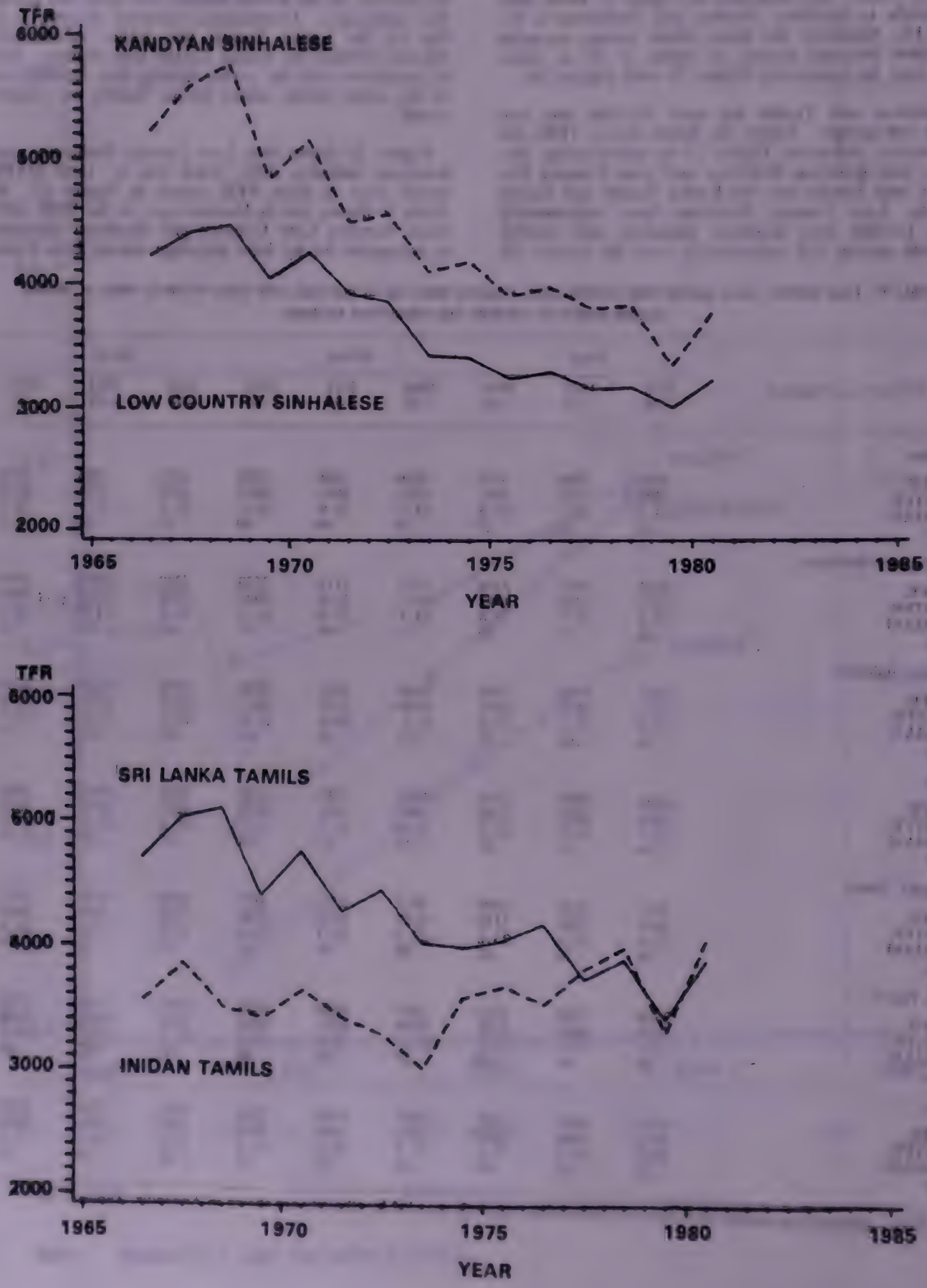


Figure 23 : Annual marital total fertility rates for Sinhalese and Tamils : whole country

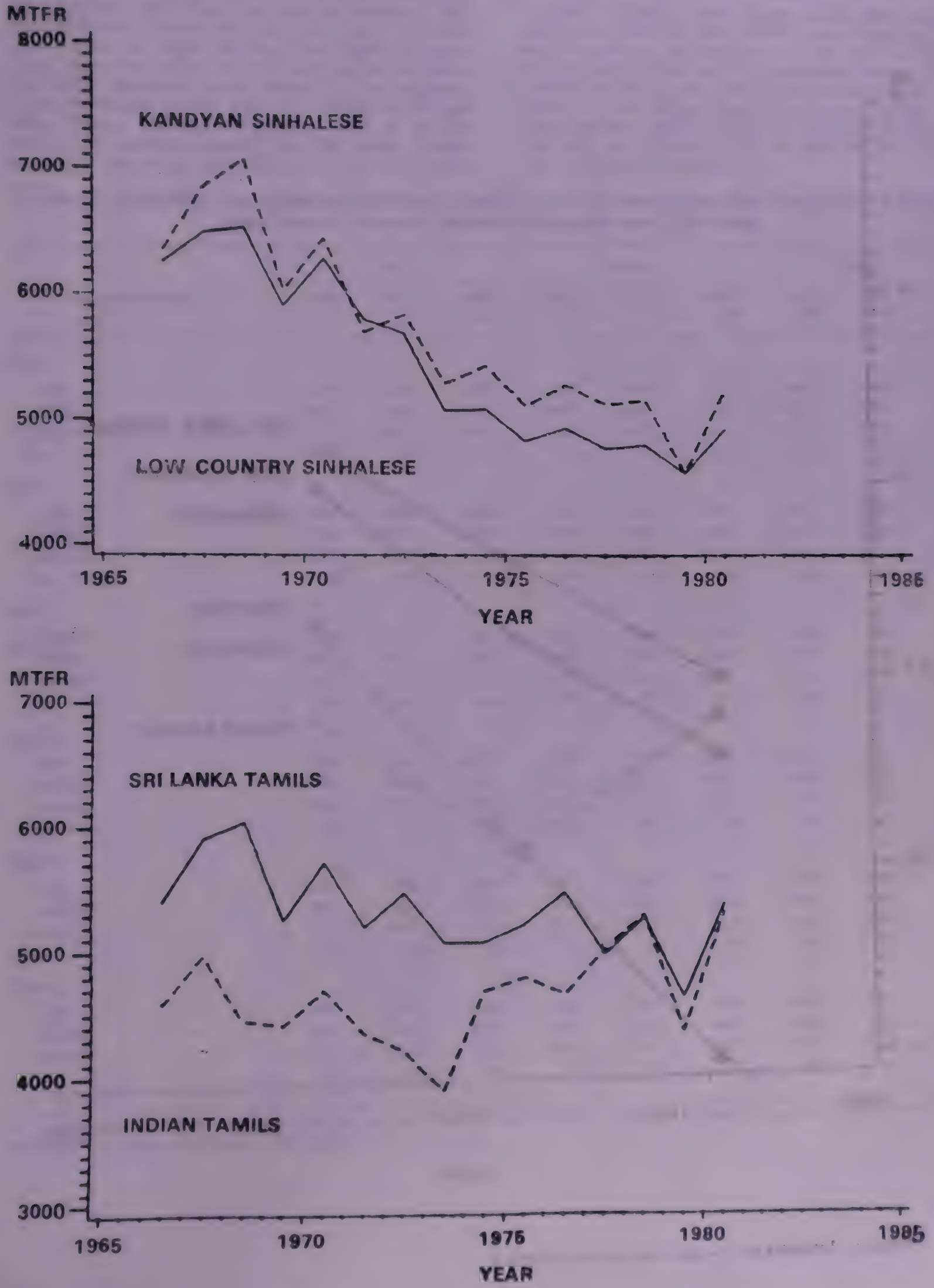
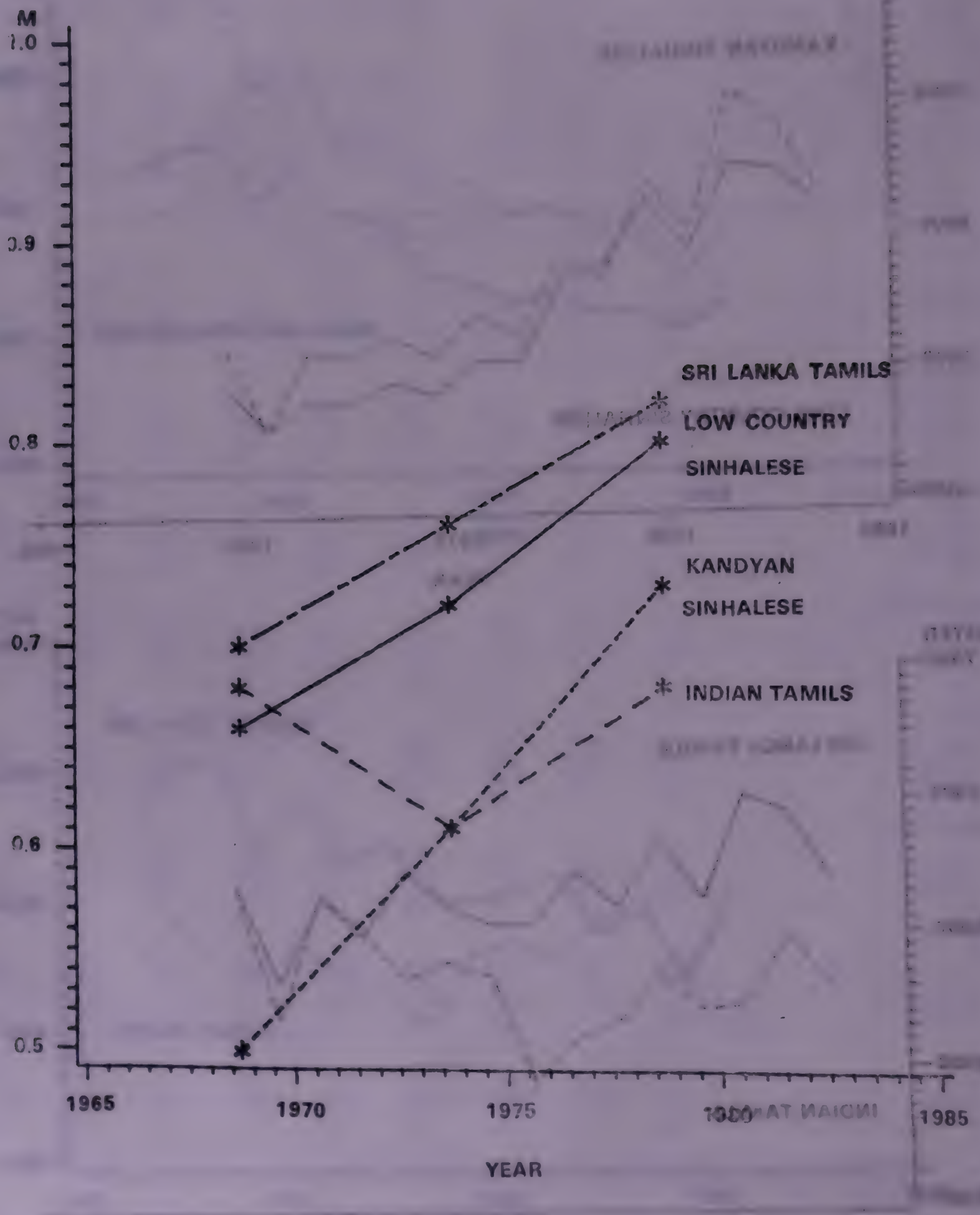


Figure 24 : Trends in the m index of marital fertility control for Sinhalese and Tamils : whole country



Source : Estimates for 5—year time periods in Table 9.

try Sinhalese than among Kandyan Sinhalese. Table 9 and Figure 24 also show levels and trends in the m index of fertility control. As expected, Low Country Sinhalese show higher values of m than Kandyan Sinhalese. Both groups show an upward trend in m, which is especially steep for Kandyan Sinhalese. The table and figure also show a sharp difference between Sri Lanka Tamils and Indian Tamils. Sri Lanka Tamils have m values higher than either Sinhalese group, whereas Indian Tamils have m values lower than either Sinhalese group, except at the beginning of the estimation period when Sri Lanka Tamils and Indian Tamils had about the same value of m. The value of m increases steadily for Sri Lanka Tamils, but it falls then rises, with little net change, for Indian Tamils. It is evident that as far as fertility behavior is concerned, Indian Tamils and Sri Lanka Tamils are two quite distinct groups.

Fertility estimates for geographic subdivisions

Tables 10 and 11 and Figures 25-32 show total fertility rates, marital total fertility rates singulate mean age at marriage, and values of the m index of marital fertility control for the six geographic zones and 24 districts of Sri Lanka (districts as defined in the 1981 census). The tables provide estimates for the three time periods 1966-70, 1971-75 and 1976-80, whereas the maps in Figures 25-32 are just for the first and last of these three periods.[29]

Table 10 : Total fertility rates, marital total fertility rates, singulate mean age at marriage, and values of the m index of marital fertility control by urban-rural residence for geographic zones of Sri Lanka

Zone and measure	Total			Urban			Rural		
	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80
Zone 1									
TFR	4153	3194	2590	4240	3126	2472	3917	3376	2917
MTFR	5874	4738	4011	5969	4670	3873	5627	4915	4372
SMAM	23.7	24.3	25.0	23.5	24.3	25.1	21.2	24.4	24.6
m	.80	.84	.88	.78	.85	.88	.82	.80	.89
Zone 2									
TFR	4190	3505	3158	4224	3299	2746	4143	3530	3254
MTFR	6358	5378	4962	6352	5110	4411	6310	5406	5082
SMAM	24.7	25.0	25.4	24.4	24.9	25.4	24.8	25.1	25.3
m	.64	.70	.79	.78	.85	.89	.62	.68	.77
Zone 3									
TFR	5470	4752	4363	4395	3605	3203	5544	4850	4445
MTFR	6252	5621	5340	5540	4727	4428	6269	5679	5384
SMAM	21.5	22.0	22.5	22.3	23.0	23.8	21.4	21.9	22.4
m	.51	.56	.66	.50	.66	.93	.50	.55	.63
Zone 4									
TFR	6294	5244	4825	6860	4731	4185	6320	5459	5062
MTFR	6304	5498	5383	7315	5285	5094	6210	5623	5523
SMAM	19.0	19.9	20.9	20.3	21.2	22.0	18.6	19.5	20.5
m	.38	.59	.66	.35	.81	.84	.40	.54	.61
Zone 5									
TFR	4747	4206	3906	5211	3863	3383	4790	4368	4158
MTFR	5687	5406	5374	6589	5367	5056	5600	5448	5545
SMAM	22.1	22.9	23.7	22.5	23.5	24.5	21.9	22.7	23.4
m	.72	.81	.87	.78	.90	1.03	.70	.77	.82
Zone 6									
TFR	4675	3781	3420	4700	3297	2688	4668	3822	3484
MTFR	6011	5113	4900	6673	5025	4465	5962	5121	4933
SMAM	23.2	23.7	24.3	23.8	24.7	25.7	23.1	23.6	24.2
m	.53	.63	.75	.60	.76	.77	.52	.62	.74

[29]Figures 25-32 are based on the Map of the Districts of Sri Lanka, published in 1982 by the Demographic Training and Research Unit of the University of Sri Lanka.

Table II : Total fertility rates, marital total fertility rates, singulate mean age at marriage and values of the m index of marital fertility control for districts of Sri Lanka

District and measure	Total			Urban			Rural		
	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80
Colombo									
TFR	4153	3194	2590	4240	3126	2472	3917	3376	2917
MTFR	5874	4738	4011	5969	4670	3873	5627	4915	4372
SMAM	23.7	24.3	25.0	23.5	24.3	25.1	24.2	24.4	24.6
m	.80	.84	.88	.78	.85	.88	.82	.80	.89
Gampaha									
TFR	4117	3310	2959	4412	3323	2744	4010	3301	3043
MTFR	5996	4892	4502	6433	4994	4322	5823	4838	4565
SMAM	23.9	24.3	24.7	23.7	24.3	24.9	23.9	24.3	24.6
m	.83	.92	1.00	.82	1.00	1.00	.83	.89	1.00
Kalutara									
TFR	4033	3549	3401	4323	3551	3176	3951	3548	3464
MTFR	6320	5434	5210	6489	5349	4922	6271	5461	5292
SMAM	25.2	25.1	25.1	24.6	25.0	25.4	25.3	25.2	25.1
m	.70	.72	.80	.85	.82	.90	.67	.70	.78
Kandy									
TFR	4810	3674	3436	4746	3051	2605	4824	3764	3558
MTFR	6362	5226	5240	7144	5062	4750	6288	5259	5306
SMAM	23.5	24.3	25.0	23.7	25.1	26.4	23.5	24.2	24.8
m	.50	.63	.68	.72	.76	.87	.47	.62	.66
Matale									
TFR	5360	4131	3735	5460	3503	3070	5360	4208	3810
MTFR	6464	5262	5068	7020	4929	4887	6413	5300	5085
SMAM	22.2	22.9	23.7	23.4	24.6	25.8	22.0	22.7	23.4
m	.42	.44	.71	.37	.44	.90	.42	.44	.69
Nuwara Eliya									
TFR	3897	3549	3496	4418	3150	2918	3852	3580	3552
MTFR	5067	4755	4955	6797	4904	4635	4963	4754	4984
SMAM	23.2	23.7	24.1	25.5	25.6	25.6	23.1	23.5	24.0
m	.51	.57	.72	.75	1.35	.49	.50	.54	.73
Galle									
TFR	4351	3672	3357	4277	3342	2845	4366	3749	3481
MTFR	6933	5923	5466	6884	5606	4818	6946	6000	5609
SMAM	25.6	25.8	26.0	25.5	25.9	26.3	25.6	25.8	25.9
m	.50	.61	.68	.66	.71	.73	.47	.59	.66
Matara									
TFR	4773	4152	3609	4160	3278	2830	4845	4249	3701
MTFR	7162	6520	6024	6904	5824	5137	7183	6591	6122
SMAM	24.9	25.6	26.3	26.1	26.6	27.2	24.8	25.5	26.2
m	.45	.49	.57	.63	.58	.58	.43	.48	.57
Hambantota									
TFR	5528	4806	4047	4804	3863	2920	5594	4886	4146
MTFR	7048	6510	5824	6539	5386	4358	7107	6611	5946
SMAM	22.9	23.7	24.5	23.0	23.9	24.9	22.9	23.7	24.5
m	.41	.56	.66	.24	.45	1.20	.42	.57	.64

Table 11: Total fertility rates, marital total fertility rates, singulate mean age at marriage and values of the m index of marital fertility control for districts of Sri Lanka

District and measure	Total			Urban			Rural		
	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80	1966—70	1971—75	1976—80
Jaffna									
TFR	4499	3906	3550	4641	3795	3286	4428	3957	3678
MTFR	5736	5322	5242	6153	5472	5026	5544	5252	5341
SMAM	22.7	23.6	24.5	23.1	23.9	24.8	22.6	23.5	24.4
m	.81	.87	.96	.83	.96	1.10	.80	.82	.90
Mannar									
TFR	5631	4621	4661	4925	3846	3398	5772	4765	4896
MTFR	5439	4854	5294	5705	5116	4816	5348	4787	5378
SMAM	19.3	20.2	21.0	20.9	22.1	23.4	18.9	19.7	20.6
m	.52	.76	.72	.98	.96	.72	.46	.73	.71
Vavuniya									
TFR	6364	5447	4916	5734	4256	3599	6526	5752	5216
MTFR	6132	5763	5537	5665	4517	4371	6278	6078	5812
SMAM	20.0	20.8	21.5	20.3	21.6	22.9	19.8	20.5	21.2
m	.38	.49	.50	.60	.57	.60	.36	.48	.46
Mullaitivu									
TFR	5498	4767	4961	4698	3685	3342	5592	4906	5148
MTFR	5472	5241	5791	4914	4194	4379	5472	5325	5917
SMAM	19.1	20.2	21.3	18.4	19.8	21.3	19.4	20.4	21.4
m	.28	.46	.62	..	..	..	.29	.52	.62
Batticaloa									
TFR	6228	5178	4500	6028	4410	3728	6302	5461	4773
MTFR	6145	5352	4950	6659	5039	4506	5963	5458	5103
SMAM	19.4	20.0	20.6	21.1	21.6	22.0	18.7	19.4	20.1
m	.45	.56	.71	.52	.71	.82	.42	.52	.67
Amparai									
TFR	6435	5022	4425	6278	4037	3564	6457	5177	4562
MTFR	6616	5387	5006	6955	4567	4310	6589	5525	5120
SMAM	19.1	20.0	20.9	20.0	20.6	21.2	19.0	19.9	20.9
m	.41	.68	.78	.26	1.35	1.07	.44	.61	.76
Trincomalee									
TFR	6247	5327	5021	6063	4588	4029	6336	5701	5519
MTFR	6161	5510	5605	6159	5004	4984	6142	6739	5891
SMAM	18.3	19.8	21.2	19.5	21.1	22.7	17.4	18.9	20.4
m	.25	.47	.43	.24	.65	.78	.27	.39	.31
Kurunegala									
TFR	4762	3786	3234	4122	2939	2522	4791	3822	3264
MTFR	5744	4825	4377	6356	4786	3840	5747	4837	4395
SMAM	22.2	22.9	23.6	24.9	25.0	25.2	22.1	22.8	23.6
m	.59	.71	.84	.79	.88	.85	.59	.71	.83
Puttalam									
TFR	4618	3955	3707	4531	3783	3196	4632	3982	3789
MTFR	5445	4652	4325	5473	4798	4244	5450	4636	4340
SMAM	21.9	21.9	22.0	22.2	22.8	23.3	21.8	21.8	21.8
m	.77	.85	.95	.72	.92	.97	.78	.84	.95

Table 11 : Total fertility rates, marital total fertility rates, singulate mean age at marriage and values of the m index of marital fertility control for districts of Sri Lanka

District and measure	Total			Urban			Rural		
	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80	1966 —70	1971 —75	1976 —80
Anuradhapura									
TFR	5982	4972	4590	5450	3458	3162	6037	5113	4715
MTFR	6587	5593	5294	7325	4804	4568	6455	5618	5336
SMAM	21.0	21.4	21.7	22.7	23.5	24.2	20.7	21.1	21.5
m	.53	.49	.59	.54	.61	.95	.51	.48	.57
Polonnaruwa									
TFR	5606	4733	4140	5611	4309	3587	5609	4767	4183
MTFR	5921	5224	4826	6515	4918	4393	5871	5241	4858
SMAM	20.4	21.3	22.1	22.4	22.7	23.0	20.2	21.1	22.0
m	.41	.41	.52	.24	.54	.60	.42	.40	.51
Badulla									
TFR	5326	4244	3732	5687	4015	2685	5299	4260	3812
MTFR	6620	5587	5279	7678	5975	4810	6562	5563	5307
SMAM	23.0	23.5	24.0	24.1	24.7	25.3	22.9	23.4	23.9
m	.48	.56	.77	.73	.74	.72	.46	.55	.76
Moneragala									
TFR	6930	5846	5680	4563	4063	4028	6993	5915	5732
MTFR	7331	6600	6831	4970	4843	5363	7394	6667	6886
SMAM	20.1	21.1	22.0	..	..	..	20.3	21.2	22.0
m	.29	.47	.49	..	..	..	.29	.48	.49
Ratnapura									
TFR	4669	3906	3690	5337	3726	3097	4617	3920	3737
MTFR	6109	5224	5116	7343	5247	4768	6026	5223	5145
SMAM	23.7	23.8	24.0	23.8	24.2	24.7	23.7	23.8	24.0
m	.48	.52	.66	.27	.81	.81	.50	.56	.65
Kegalle									
TFR	4420	3540	3098	4251	3126	2864	4433	3572	3118
MTFR	6134	5204	4841	5363	4264	4296	6201	5277	4881
SMAM	23.9	24.6	25.2	22.4	23.9	25.3	24.0	24.6	25.2
m	.60	.76	.85	.52	.68	.52	.61	.77	.87

Note.- For Moneragala, the urban population in our 10 per cent sample was too small to obtain efficient estimates of SMAM and m. Hence these estimates are excluded from the table. Estimates of m for urban Mullaitivu are excluded for the same reason. (SMAM values for urban Mullaitivu, though based on few cases, seem reasonable and are retained, but they should be viewed with caution.)

Figure 25 : Total fertility rates for 1966-70 for districts of Sri Lanka

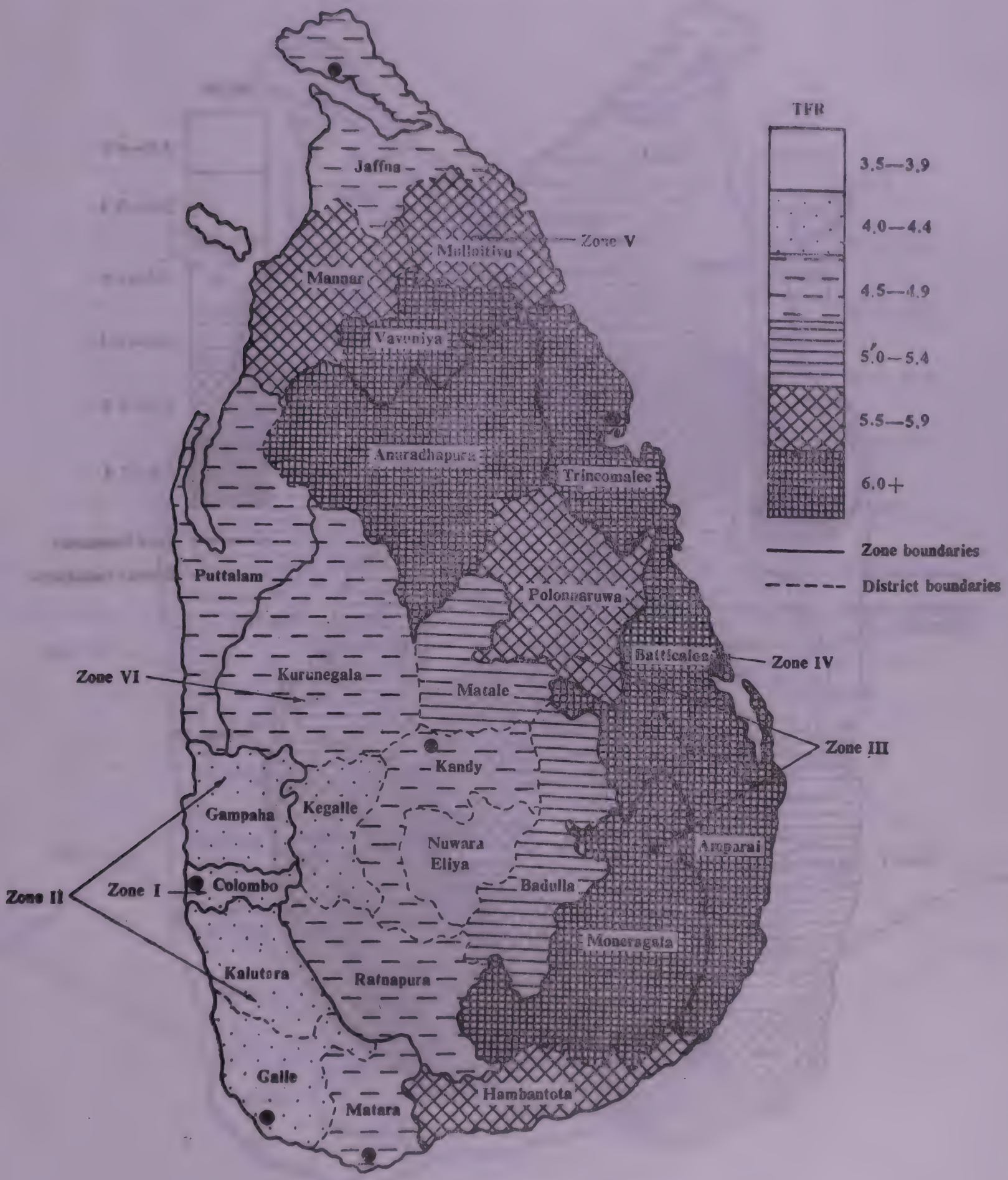


Figure 26 : Marital total fertility rates for 1966-70 for districts of Sri Lanka

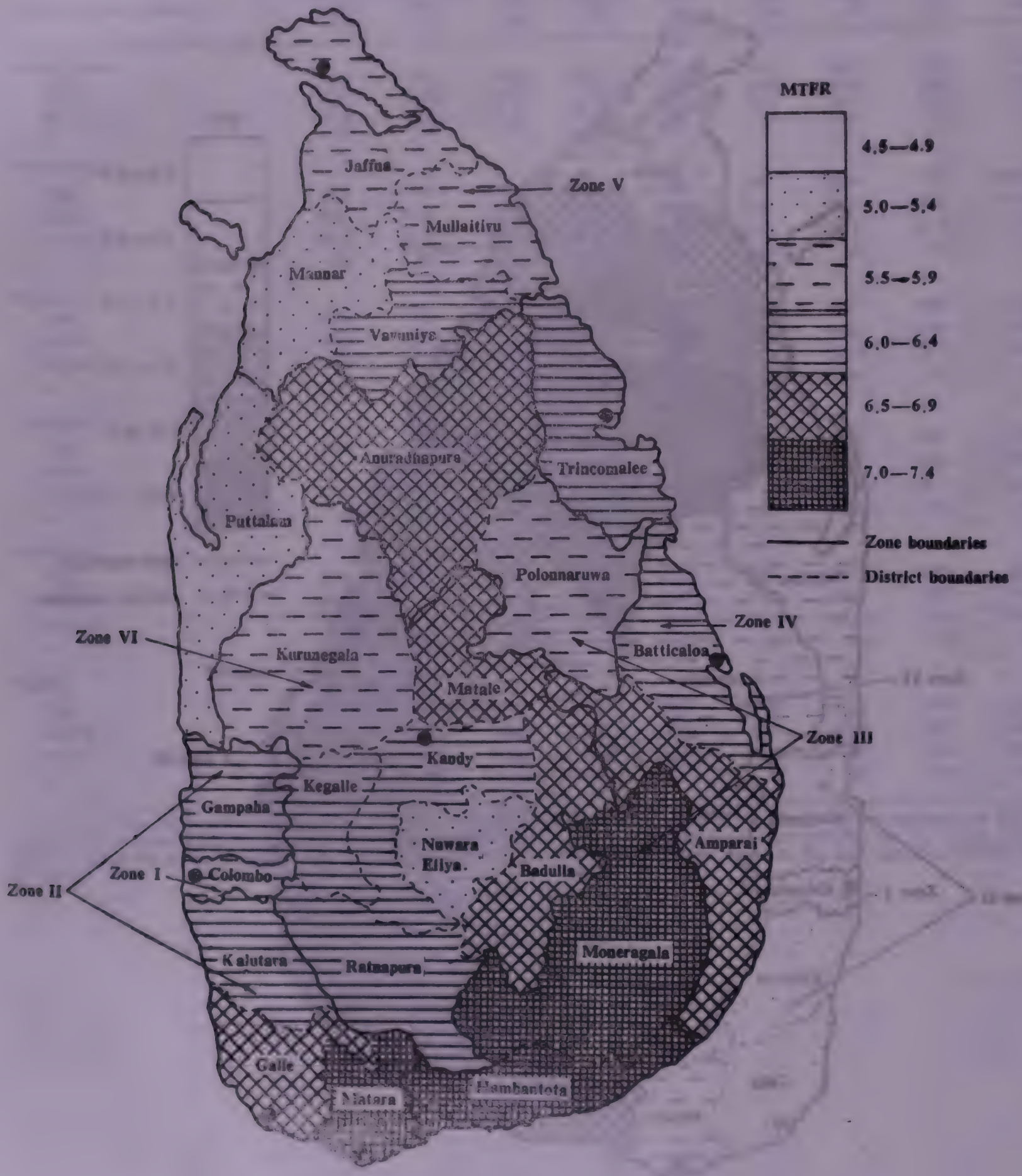


Figure 27 : Singulate mean age at marriage for 1966-70 for districts of Sri Lanka

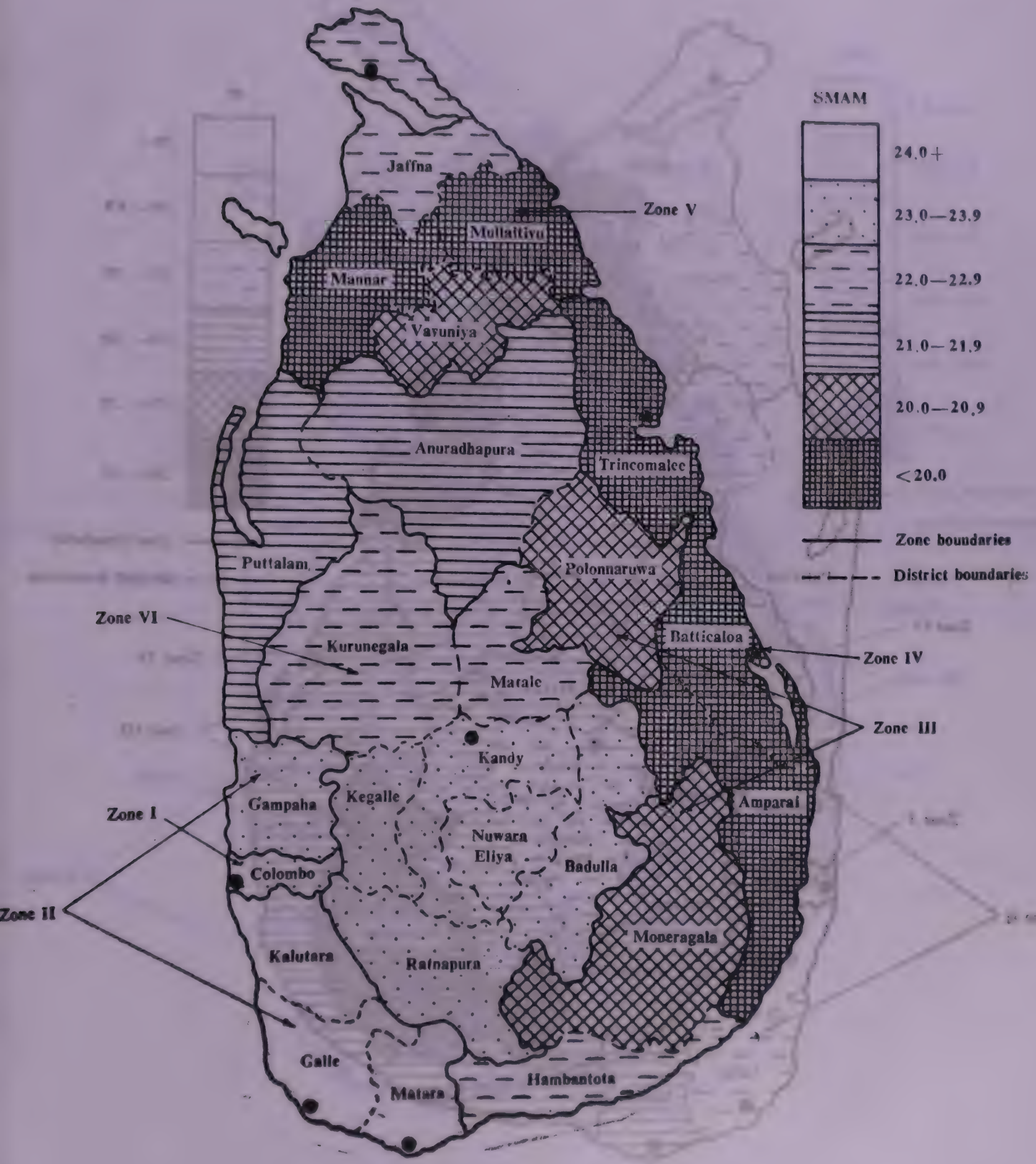


Figure 28 : m index of marital fertility control for 1966-70 for districts of Sri Lanka

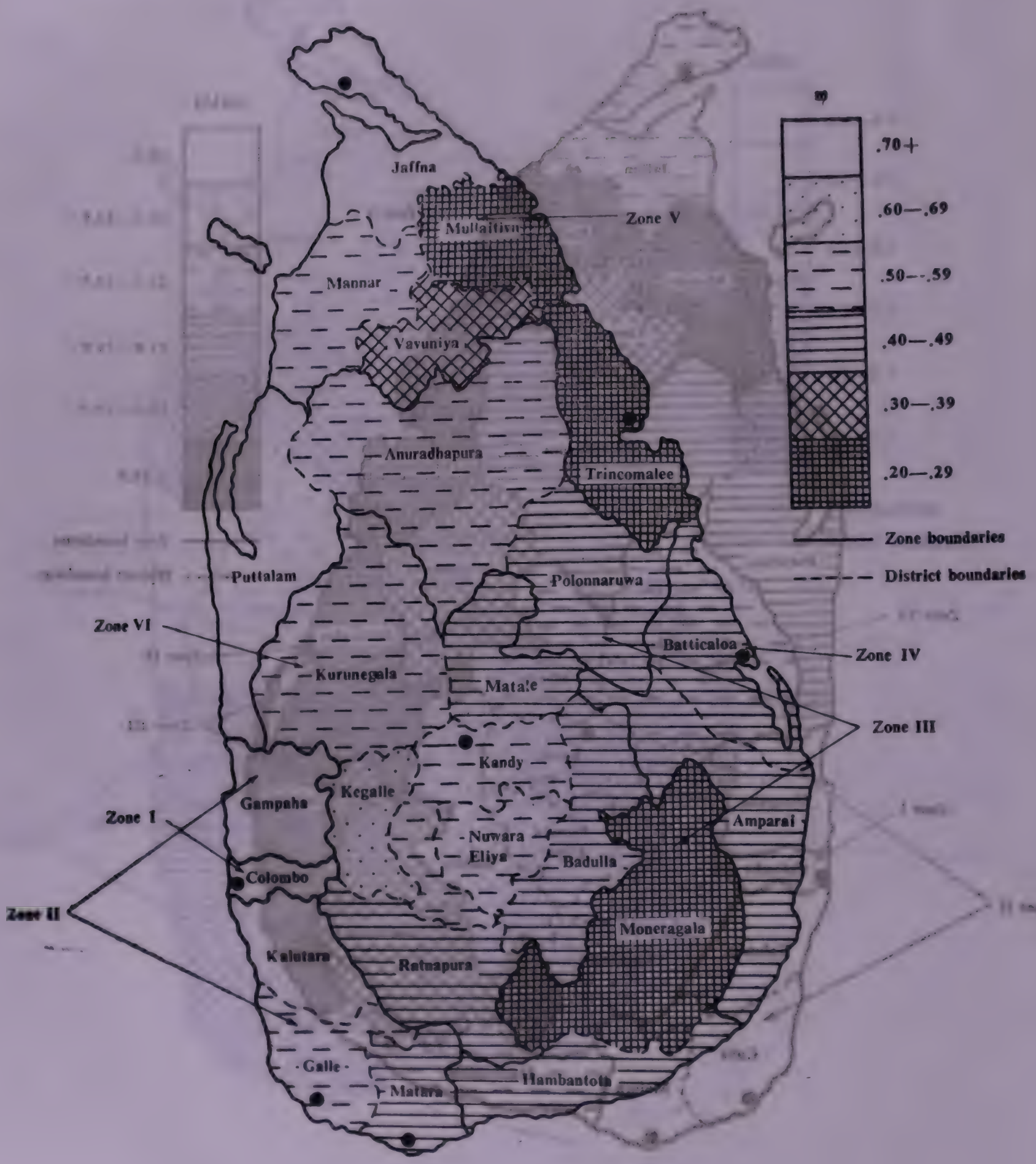


Figure 29 : Total fertility rates for 1976-80 for districts of Sri Lanka

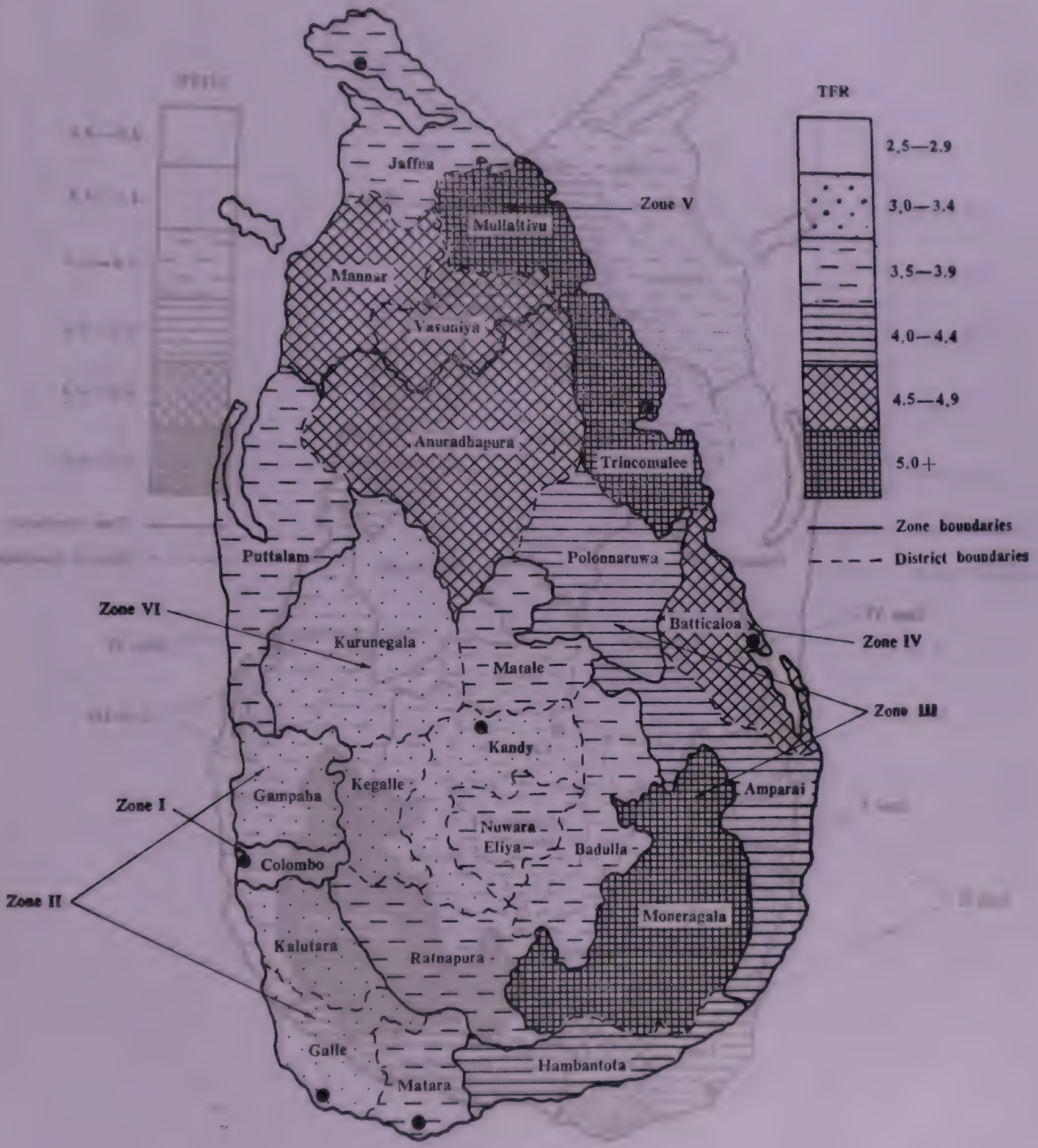


Figure 30 : Marital total fertility rates for 1976-80 for districts of Sri Lanka

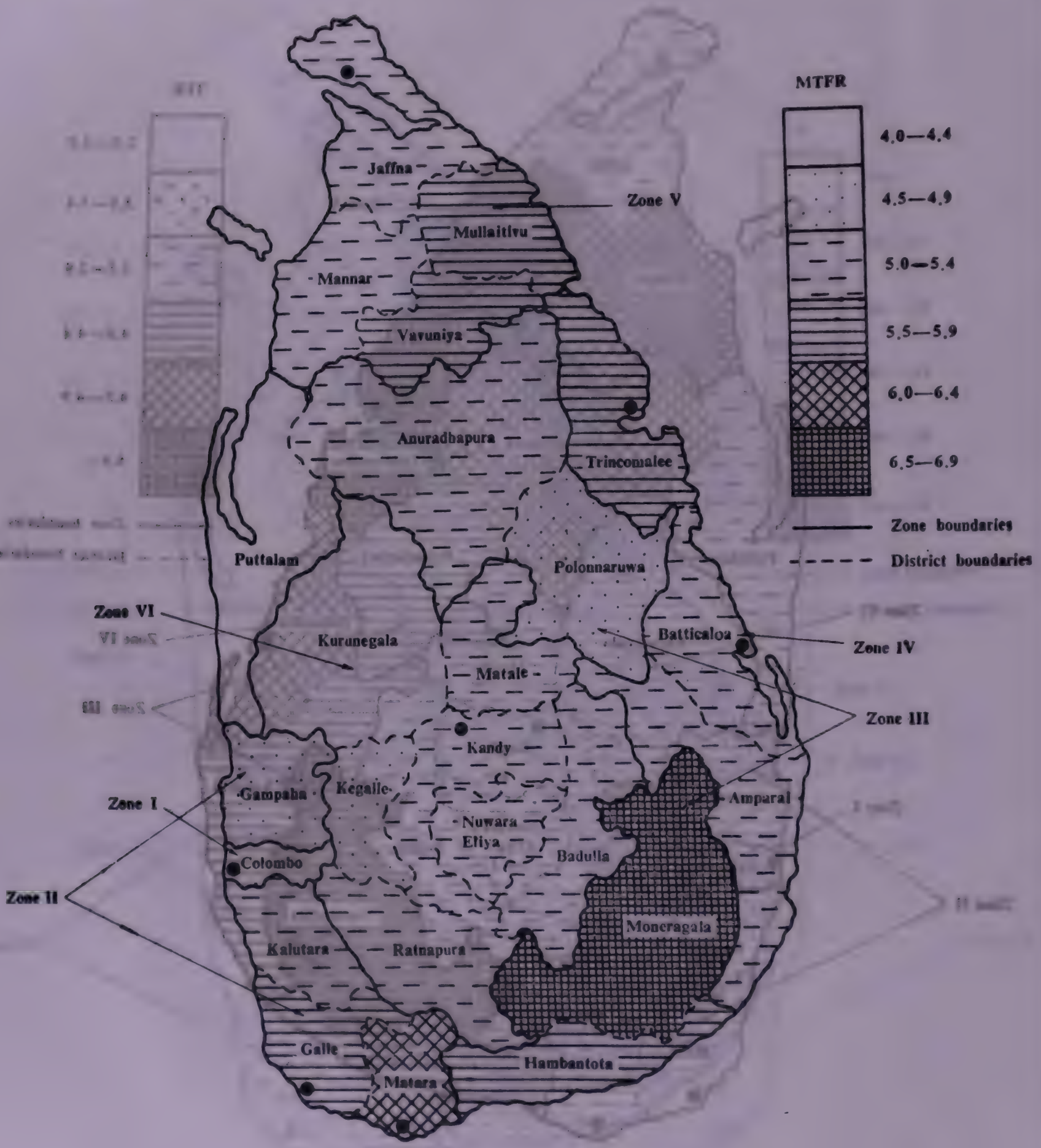


Figure 31 : Singulate mean age at marriage for 1976-80 for districts of Sri Lanka

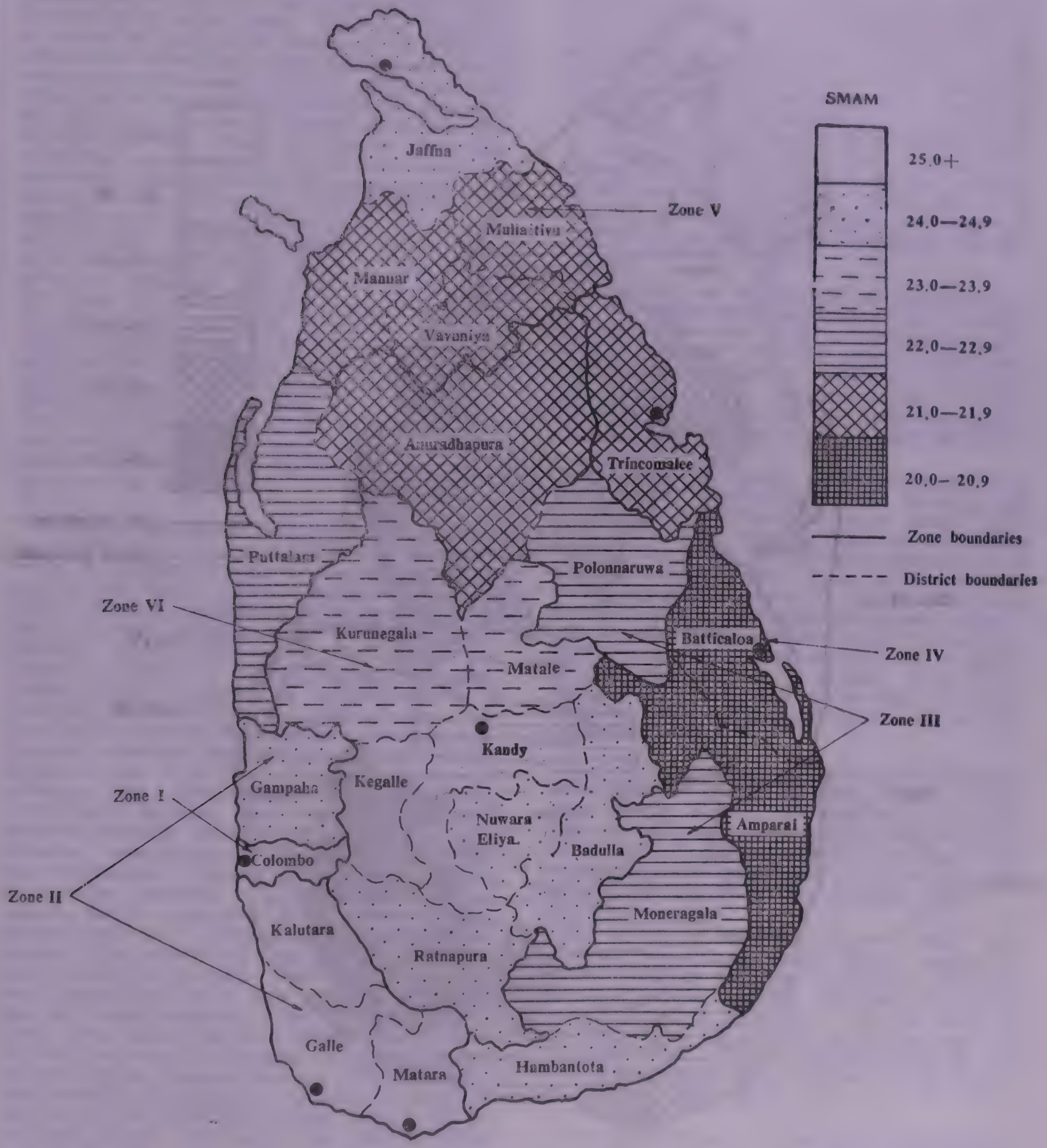
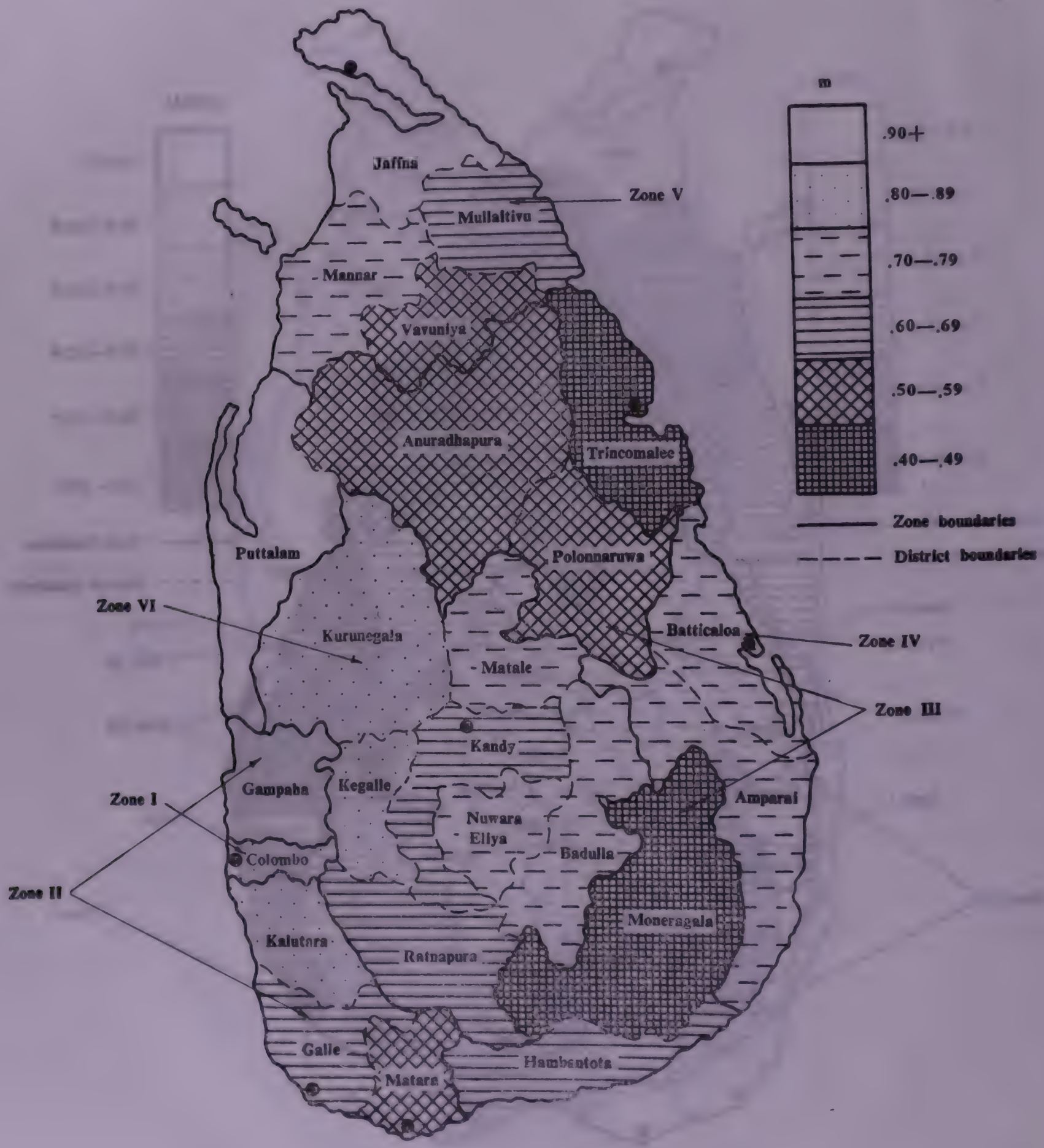


Figure 32 : m index of marital fertility control for 1976-80 for districts of Sri Lanka



The six geographic zones, the boundaries of which are indicated by dark solid lines in Figures 25-32, are defined almost in the same way as in the 1975 World Fertility Survey in Sri Lanka. Each zone consists of a number of districts, the boundaries of which are indicated by dashed lines, except for Colombo district, which is synonymous with Zone I. There are some differences in zone boundaries between this paper and the WFS, partly because of changes in district boundaries in the 1981 census. In order to keep zone boundaries coincident with district boundaries (this coincidence being convenient for purposes of aggregation), we split WFS zones II and III each into two non-continuous areas in Figures 25-32. In the WFS each of these zones was composed of contiguous areas. In the WFS scheme, the zonal map had an onion-like appearance, with Zone VI in the center and Zones III and IV wrapped around it in concentric layers to the east, north, and south of zone VI. Zones I (Colombo) and II (coastal districts in the neighbourhood of Colombo) are in the southwest corner of the country, and Zone V (Jaffna and neighbouring districts) includes the northern tip of the country. Since in this report Zones II and III each consist of non-contiguous areas, the zonal map is somewhat more complex here than in the WFS. However, the differences are rather minor.

In order to interpret the geographic pattern of fertility in Figures 25-32, it is useful first to describe briefly the character of each of the six zones (c.f. the maps in the figures). Zone I consists of Colombo district, including metropolitan Colombo, with a population of about 1,698,000. Zone I is highly heterogeneous in terms of socio-economic characteristics, and contains a mixture of ethnic, religious, and social groups. Zone II includes the coastal districts of Gampaha, Kalutara, Galle, and Matara in the neighbourhood of Colombo. Each of these districts in comparatively urbanized, though not as much as Colombo district, so that Zone II is a relatively modern and urbanized zone. Ethnically this zone is primarily Low-Country Sinhalese, and religiously it is predominantly Buddhist. Zone III includes the districts of Puttalam, Anuradhapura, Polonnaruwa, Moneragala and Hambantota. Puttalam on the west coast has an economy dependent to a considerable extent on coconut and to a somewhat lesser extent on fishing. Anuradhapura and Polonnaruwa were the ancient capitals of the country and today are devoted in large part to paddy rice growing. Previously, these districts were characterized by a high incidence of malaria and were largely neglected by the British colonial regime. Now malaria has been brought under control and the government is sponsoring resettlement schemes in these districts. Anuradhapura and Polonnaruwa are predominantly Sinhalese, who account for about 90 per cent of the population of either district. Of the remaining 10 per cent, nearly 7 per cent are Moors in both districts.

Moneragala district in Zone III is perhaps the most isolated district in the country, and, as we shall see later, this isolation is reflected in the district's demographic characteristics. Moneragala is predominantly Sinhalese, but it is cut off somewhat from the Kandyan Sinhalese in Zone VI by mountain ranges, and from the Low Country Sinhalese in Hambantota and districts in Zone II by a lack of well-developed transportation facilities. Historically, too, there are important reasons for the isolation of this area, which was almost completely neglected during the British colonial era. Not only was the area unsuitable for tea cultivation, but also many political uprisings against the British took place there. On its northern and eastern boundaries, Moneragala is somewhat culturally isolated from the neighbouring coastal districts of Batticoloa and Amparai. Batticoloa has a high concentration of Sri Lanka Tamils and Moors, and Amparai is predominantly Moor.

These latter two districts fall in Zone IV, which includes districts along the Eastern coast, including Trincomalee (formerly the site of a British naval base, since nationalized). Zone IV, being a coastal zone with port facilities, is more modern and less isolated than Zone III. These characteristics tend to depress its fertility, but its predominantly Moor and Muslims character tends to act in the opposite direction.

Zone V is predominantly Sri Lanka Tamil and includes the districts of Jaffna, Mannar, Vavuniya, and Mullaitivu at the northern end of the country. Jaffna is the second most urbanized district in the country, next to Colombo, but the other three districts in Zone V are predominantly rural. Except for Mannar, Zone V is predominantly Hindu. In Mannar, however, Roman Catholics and Muslims are the two major religious groups. Jaffna, Mullaitivu, and Vavuniya are predominantly Hindu-Tamil, with over 85, 75, and 55 per cent, respectively, in this category. Zone V is a relatively highly developed area in terms of resource utilization, while Jaffna district additionally has high educational levels.

Zone VI is located in the south-central hill country and includes the districts of Kandy, Matale, Nuwara Eliya, Badulla, Kegalle, Ratnapura and Kurunegala. This zone contains most of the tea plantations of the island. More than 85 per cent of Indian Tamils, who work mainly on the plantations, live in this zone. The city of Kandy has a population of about 100,000.

The dry zone of the country (part of which was historically the malarial zone), which receives an annual rainfall of less than 75 inches, is contained mainly in interior Zone III. The west zone of the country includes Zones I and II and most areas in Zone VI. Zone IV also falls in the dry zone, but historically it was not highly malarial, unlike the rest of the dry zone in the interior. Zone V in the north is also primarily within the dry zone.

With this background, we turn now to the interpretation of Tables 10 and 11 and the maps in Figures 25-32. Figures 25-28 present maps for TFR, MTFR, SMAM and m for the period 1966-70. Progressively darker shading is used to indicate values associated with higher fertility. In general, Zones I, II, V and VI, in which urbanization influences are more strongly

felt, tend to show low-fertility values on the four indices, and Zones III and IV tend to show high-fertility values. However, these generalizations mask a good deal of variation within zones as well as a good many exceptions in the case of particular districts. One of the most interesting districts is Nuwara Eliya in Zone VI in the south central area of the country. This district has the highest concentration of Indian Tamils of any district in the country. It is primarily a rural district dominated by tea plantations. In 1966-70, Nuwara Eliya had the lowest TFR and close to the lowest MTFR of any district, as shown in Figures 25 and 26. Its mean age at marriage was comparatively high, but not as high as in Zone II. It showed a moderate degree of marital fertility control, as indicated by the m index in Figure 28, but not as much as in the west coast districts or in Jaffna. Possibly important reasons for the low fertility of Nuwara Eliya at this time were lengthy and intensive breastfeeding and perhaps some use of induced abortion by Indian Tamils, as hypothesized earlier.

A striking feature of Figure 27 is the low age at marriage (below 20, on average) in 1966-70 in the Moor—Muslim districts. In addition, the districts of Mannar, Vavuniya and Mullaitivu also have a mean age at marriage below 20. Apparently the relatively high fertility in 1966-70 in these districts was due in large part to relatively low age at marriage. The predominantly Sinhalese but rather isolated district of Moneragala also had a comparatively low mean age at marriage (between 20 and 21), but not as low as the predominantly Moor-Muslim districts. However, regarding the m index of marital fertility control for 1966-70 in Figure 28, Moneragala, Trincomalee and Mullaitivu had the lowest level of marital fertility control ($m < 0.3$) of all districts in the country. The highest levels of marital fertility control ($m > 0.7$) were found in Colombo and neighbouring coastal districts and in Jaffna district. Jaffna, which is predominantly Sri Lanka Tamil-Hindu, had an m value in excess of 0.7, whereas neighbouring Mullaitivu had an m value below 0.3. With some exceptions, these findings support earlier findings from other studies that show that ethnicity and religion can be potent barriers to the diffusion of the practice of family limitation.[30] The comparison of Jaffna with other Hindu-Tamil districts also shows the importance of urban-rural residence and other socio-economic factors.

The maps in Figures 29-32 show the same indices as in Figures 25-28, but ten years later during the period 1976-80. Fertility fell substantially in the intervening ten years, even more than the shading of maps indicates, since the fertility ranges corresponding to the various shadings have also been defined downward: for example, whereas the darkest shading in Figure 25 indicates TFRs of 6 or higher, this shading in Figure 29 indicates TFRs of 5 or higher.

In Figure 29, Nuwara Eliya district no longer has lowest TFR of the districts. A number of other districts are now lower, and it is evident from Figure 32 that a number of other districts have greatly surpassed Nuwara Eliya in the extent of martial fertility control as indicated by the m index. It is also noteworthy in Figure 32 that by 1976-80 Mullaitivu and the predominantly Moor-Muslim districts of Batticoloa and Amparai experienced substantial increases in the m index, with Trincomalee lagging somewhat behind but also with an increase. The isolated district of Moneragala continues to show one of the lowest incidences of marital fertility control.

In some districts, like Matara, there is evidence that a very late mean age at marriage may have delayed adoption of birth control, since the m index is comparatively low in this relatively modernized district in 1976-80. On the whole, however, districts with later age at marriage also tend to have relatively low marital fertility and relatively high m values. As noted earlier, this latter pattern is consistent with a "multiphasic response" to modernization, in which delayed marriage and increased marital fertility control both play an important role.[31]

Table 12 compares registration-based estimates with own-children estimates of total fertility rates for districts in 1971. Given the generally high quality of the 1981 census data, registration/own-children ratios substantially below unity in Table 11 may indicate underregistration of births in some districts.

Table 12: Total fertility rates for districts of Sri Lanka in 1971: Comparison of registration-based estimates and own-children estimates

District	Registration	Own-children	Registration/ Own-Children
1	2	3	4
Colombo	3.8	3.7	1.03
Kalutara	3.6	3.9	.92
Kandy	4.1	4.1	1.00
Matale	4.6	4.4	1.05
Nuwara Eliya	3.7	3.8	.97
Galle	3.7	4.1	.90
Matara	4.4	4.5	.98
Hambantota	4.8	5.5	.87
Jaffna	4.2	4.0	1.05
Mannar	5.3	4.9	1.08
Vavuniya	5.7	5.5	1.04
Batticaloa	5.4	5.6	.96
Trincomalee	5.5	5.7	.96
Kurunegala	4.0	4.2	.95
Puttalam	4.3	4.3	1.00
Anuradhapura	5.3	5.3	1.00

[30] *See*, for example, A.J. Coale, "The Demographic Transition," in *International Population Conference, Liege* 1973 (Liege: International Union for the Scientific Study of Population, 1973), Vol. 1, pp. 53-72; and R. Lesthaeghe, *The Decline of Belgian Fertility*, 1800–1970 (Princeton: Princeton University Press, 1977).

[31] *See* Davis, *loc. cit.* in footnote 25.

Table 12—*Concld.*

District	Rgistration	Own-Children	Registration/ Own Children
1	2	3	4
Badulla	4.8	5.2	.92
Ratnapura	4.1	4.1	1.00
Kegalle	3.2	3.8	.84

Notes : The registration-based TFR estimates from Langford are for only 19 districts in 1971, so that comparisons with 1953 and 1963 could be made. The districts of Amparai, Polonnaruwa, and Moneragala, which are indicated in parentheses in Langford's paper, were also functioning as separate administrative districts in 1971, making a total of 22 districts in 1971. By 1981, there were 24 districts. Two new districts, Gampaha and Mullaitivu, were created by 1981.

In order to make precise comparisons between the own-children fertility estimates and Langford's registration-based estimates, taking into account the changes in district definitions by 1981, the computations were done in the following way: Firstly, we identified the sets of districts that had to be combined to obtain geographic areas comparable with Langford's. We combined Colombo and Gampaha (1981 definitions) into Colombo; Batticaloa and Amparai into Batticaloa; Vavuniya and Mullaitivu into Vavuniya; Anuradhapura and Polonnaruwa into Anuradhapura; and Badulla and Moneragala into Badulla. Secondly, we identified the own-children arrays of age-specific birth rates for 1970 and 1971 (1970.2-1971.2 and 1971.2-1972.2) and combined them as described in the note to Figure 3 in order to obtain rates for January 1971 to January 1972, which is the time reference period of Langford's estimates.

Source: Registration-based estimates are from C.M. Langford, "Fertility Change in Sri Lanka Since the War: An Analysis of the Experiences of Different Districts," *Population Studies* 35 (1981): 285—306. Own-children estmates are based on the 1981 census.

Conclusion

This report has presented findings from a study of fertility levels and trends in Sri Lanka based on an application of the own-children method of fertility estimation to the 1981 census of Sri Lanka. The analysis has been based on several related measures, including total fertility rates and age-specific birth rates for both all women and currently married women, singulate mean age at marriage and age-specific proportions currently married, and the Coale-Trussell m index of marital fertility control. The results show that fertility transition is well underway in Sri Lanka and is most advanced among those who are urbanized and educated. Ethnicity and religion have substantial effects on fertility that appear independent, to some extent at least, of the effects of socio-economic factors. A continuing demographic anomaly is the ethnic group of Indian Tamils in the estate sector, who were the only group to experience fertility increases over the estimation period, perhaps due mainly to a hypothesized trend toward shorter breastfeeding. These general observations mask considerable diversity in fertility levels and trends by socio-economic characteristics and geographic sub-divisions.

Acknowledgment

We are grateful to Judith Tom and Robin Loomis for computer programming and research assistance. Support for this study was provided by the Sri Lanka Department of Census and Statistics, the East-West Population Institute, and the United States Agency for International Development.

Appendix Table 1: Total fertility rates and age-specific birth rates by education (completed years of schooling) and urban-rural residence

Education, residence and time period	TFR	Age						
		15—19	20—24	25—29	30—34	35—39	40—44	45—49
0—5								
Whole Country								
1966—70	5328	113	251	266	217	139	61	18
1971—75	4487	92	219	231	183	112	46	14
1976-80	4215	79	220	223	166	99	42	14
Urban								
1966—70	5355	127	270	273	203	121	53	24
1971—75	4118	101	211	220	150	88	38	16
1976—80	3644	74	198	188	140	74	35	20
Rural								
1966—70	5285	110	246	263	218	141	62	17
1971—75	4529	90	219	232	188	116	48	14
1976—80	4291	80	222	228	169	103	43	14
Estate								
1966—70	3417	48	153	186	149	92	40	15
1971—75	3347	40	144	184	157	91	41	13
1976—80	3726	42	176	206	166	100	42	15
6—10								
Whole Country								
1966—70	4269	44	158	234	213	136	54	14
1971—75	3538	38	142	194	173	107	41	11
1976—80	3146	35	138	177	145	88	35	11
Urban								
1966—70	4306	47	168	240	212	126	50	17
1971—75	3227	39	137	184	154	86	34	12
1976—80	2632	34	115	151	121	68	27	11
Rural								
1966—70	4332	43	157	235	218	145	57	12
1971—75	3697	39	145	200	182	118	46	11
1976—80	3358	36	147	187	156	96	39	11
Estate								
1966—70	3149	31	131	175	142	89	54	7
1971—75	3095	37	125	184	149	76	24	24
1976—80	3367	32	159	199	148	84	36	16
11+								
Whole Country								
1966—70	3097	10	44	135	211	156	50	13
1971—75	2556	4	35	122	169	125	47	9
1976—80	2038	4	28	105	141	93	32	5
Urban								
1966—70	3219	10	52	157	227	148	39	10
1971—75	2424	4	39	129	158	108	38	8
1976—80	1762	3	27	98	124	71	24	6
Rural								
1966—70	3140	10	42	126	209	167	59	15
1971—75	2716	3	34	121	180	140	55	10
1976—80	2256	4	29	110	154	110	39	5

NOTE: The estate sector is omitted under the 11+ education category because of an insufficient number of cases.

Appendix Table 2: Marital total fertility rates and age-specific marital birth rates by completed years of education and urban-rural residence

Education, residence and time period	MTFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
0—5								
Whole country								
1966—70	5992	743	410	312	238	150	68	21
1971—75	5218	572	364	281	206	124	53	16
1976—80	5115	471	372	280	192	113	48	17
Urban								
1966—70	5996	819	439	313	223	134	60	29
1971—75	4828	664	361	269	171	101	45	20
1976—80	4628	496	359	247	166	87	42	24
Rural								
1966—70	5944	726	402	310	238	151	68	20
1971—75	5257	557	362	281	211	128	54	16
1976—80	5170	466	373	284	195	117	49	16
Estate								
1966—70	4590	673	348	241	166	101	45	17
1971—75	4456	461	309	241	178	102	47	15
1976—80	5011	403	358	271	193	113	48	19
6—10								
Whole country								
1966—70	6612	780	475	364	255	152	60	16
1971—75	5466	634	400	300	211	122	47	13
1976—80	4870	543	366	272	182	102	40	13
Urban								
1966—70	6688	818	499	363	257	142	57	20
1971—75	5148	646	399	288	191	99	39	14
1976—80	4255	542	328	245	153	80	32	12
Rural								
1966—70	6682	773	472	369	259	160	63	14
1971—75	5639	634	402	307	221	133	51	13
1976—80	5113	546	378	282	194	112	44	13
Estate								
1966—70	4715	544	385	237	155	101	57	8
1971—75	4418	600	324	251	170	85	26	28
1976—80	4849	496	371	273	176	93	39	18
11+								
Whole country								
1966—70	6521	316	417	372	268	176	56	15
1971—75	5567	123	337	343	224	146	53	11
1976—80	4604	124	272	297	197	112	37	6
Urban								
1966—70	6638	299	374	418	296	182	45	12
1971—75	5252	145	310	344	212	131	44	10
1976—80	3954	125	240	260	171	85	27	6
Rural								
1966—70	6816	347	486	354	260	181	65	17
1971—75	5946	116	371	348	237	160	61	11
1976—80	5120	125	300	324	216	134	44	5

NOTE : Here as elsewhere, MTFRs are obtained by summing age-specific marital birth rates over the age range 20-49.

Appendix Table 3:—Singulate mean age at marriage and age-specific proportions currently married by completed years of education and urban-rural residence: 1971 and 1981 (proportions in per cent)

Education, residence and date	SMAM	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
0—5								
Whole country								
1971	21.6	15.7	60.6	83.5	89.9	91.2	88.9	85.8
1981	22.2	17.2	58.4	78.2	85.1	86.8	85.1	82.7
Urban								
1971	21.6	15.4	59.6	83.7	88.9	88.5	86.4	83.9
1981	22.8	14.8	53.5	73.3	82.6	83.4	81.9	81.2
Rural								
1971	21.6	15.8	60.7	83.5	90.0	91.7	89.5	86.3
1981	22.2	17.6	59.2	79.0	85.5	87.4	85.6	83.0
6—10								
Whole country								
1971	25.1	5.9	34.7	64.6	82.5	88.6	88.8	86.7
1981	25.2	6.7	39.0	65.2	79.1	84.8	86.6	86.0
Urban								
1971	25.0	5.9	34.1	64.8	81.4	87.5	87.6	86.1
1981	25.7	6.3	35.2	60.6	78.0	83.6	85.8	86.1
Rural								
1971	25.1	5.9	35.0	64.5	83.0	89.2	89.5	87.1
1981	25.0	6.9	40.3	66.8	79.5	85.2	87.0	85.9
11+								
Whole country								
1971	28.0	3.1	10.5	36.0	76.7	86.5	89.1	87.4
1981	29.2	2.8	10.2	35.0	70.0	81.2	87.5	89.1
Urban								
1971	27.1	3.2	13.0	37.6	75.4	82.0	87.0	82.6
1981	28.7	2.6	10.6	37.4	71.2	83.8	87.1	89.2
Rural								
1971	28.6	2.9	8.9	35.0	77.6	89.3	90.3	90.3
1981	29.6	2.9	10.0	33.6	69.3	79.4	87.9	89.1

Appendix Table 4: Total fertility rates and age-specific birth rates by religion: whole country

Religion and time period	TFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Buddhist								
1966—70	4742	61	188	250	223	146	64	17
1971—75	3845	49	159	205	181	115	48	13
1976—80	3410	45	153	185	151	95	40	13
Hindu								
1966—70	4402	80	200	232	191	115	46	17
1971—75	3912	65	175	214	174	102	41	12
1976—80	3836	52	177	213	172	99	39	14
Muslim								
1966—70	5975	142	285	298	232	143	64	31
1971—75	4836	104	235	249	190	117	49	23
1976—80	4249	73	208	228	175	100	46	21
Christian								
1966—70	4099	60	179	230	188	107	40	15
1971—75	3410	54	158	193	154	84	29	10
1976—80	3073	48	150	174	134	70	27	11

Appendix Table 5: Marital total fertility rates and age-specific marital birth rates by religion: whole country

Religion and time period	MTFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Buddhist								
1966—70	6426	714	433	344	256	161	71	19
1971—75	5387	554	371	292	215	130	54	15
1976—80	4961	500	361	274	186	110	46	15
Hindu								
1966—70	5326	571	373	281	213	126	52	20
1971—75	4939	492	342	273	198	113	47	15
1976—80	5120	429	363	286	201	112	45	17
Muslim								
1966—70	6412	638	424	332	253	159	75	39
1971—75	5534	535	384	292	212	132	58	30
1976—80	5254	443	374	283	199	114	54	26
Christian								
1966—70	5858	773	437	329	220	122	46	18
1971—75	4920	603	379	277	186	97	34	12
1976—80	4492	470	353	252	165	82	32	14

Appendix Table 6: Singulate mean age at marriage and age-specific proportions currently married by religion: 1971 and 1981 (proportions in per cent)

Religion and date	SMAM	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Buddhist								
1971	23.9	8.7	43.2	71.0	85.2	89.4	88.5	86.0
1981	24.7	9.1	42.2	66.3	79.9	85.2	86.0	84.6
Hindu								
1971	22.7	13.5	52.2	79.9	88.4	90.4	87.5	83.2
1981	23.7	11.8	47.5	72.7	84.8	87.8	85.8	82.8
Muslim								
1971	21.0	20.5	63.5	87.0	90.4	89.5	84.5	78.9
1981	22.7	15.1	52.5	78.0	87.0	87.5	84.4	78.2
Christian								
1971	23.9	8.5	41.5	69.7	84.1	86.7	87.2	83.9
1981	24.3	10.8	42.8	68.8	79.8	84.7	84.9	83.1

Appendix Table 7: Total fertility rates and age-specific birth rates by ethnicity: whole country

Ethnicity and time period	TFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Sinhalese								
1966—70	4690	61	187	249	220	143	62	16
1971—75	3808	49	159	204	179	113	46	13
1976—80	3378	46	153	183	149	93	39	13
Low-Country Sinhalese								
1966—70	4265	49	162	229	206	135	56	15
1971—75	3523	44	141	190	170	106	43	11
1976—80	3136	41	136	170	143	89	36	12
Kandyan Sinhalese								
1966—70	5292	76	222	275	240	156	71	19
1971—75	4198	56	183	223	191	121	50	16
1976—80	3696	51	174	202	158	99	42	14
Tamils								
1966—70	4401	80	199	231	193	116	45	17
1971—75	3896	64	174	213	174	103	40	12
1976—80	3781	51	174	212	170	97	39	14
Sri Lanka Tamils								
1966—70	4793	91	218	252	209	124	47	18
1971—75	4140	72	188	226	182	109	40	11
1976—80	3808	54	172	215	173	97	38	12
Indian Tamils								
1966—70	3590	55	163	190	158	96	41	16
1971—75	3398	45	146	189	156	89	42	12
1976—80	3727	44	176	204	163	98	42	17
Moors								
1966—70	6034	146	292	303	234	140	63	30
1971—75	4892	107	239	250	192	117	50	24
1976—80	4297	74	210	230	177	102	45	20

Appendix Table 8: Marital total fertility rates and age-specific marital birth rates by ethnicity: whole country

Ethnicity and time period	MTFR	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Sinhalese								
1966—70	6404	726	436	345	254	159	69	19
1971—75	5357	560	372	291	213	128	52	15
1976—80	4917	500	360	272	184	108	45	15
Low-Country Sinhalese								
1966—70	6286	728	440	341	244	151	63	17
1971—75	5270	584	373	290	207	122	49	13
1976—80	4792	505	352	266	180	104	42	14
Kandyan Sinhalese								
1966—70	6541	716	428	344	267	169	79	22
1971—75	5454	532	368	293	220	135	57	18
1976—80	5059	492	368	278	188	113	48	16
Tamils								
1966—70	5366	581	375	285	214	127	51	21
1971—75	4969	498	346	274	198	115	46	14
1976—80	5102	429	363	286	199	110	45	17
Sri Lanka Tamils								
1966—70	5664	555	386	306	232	135	53	22
1971—75	5209	502	363	290	208	122	45	14
1976—80	5164	438	367	294	204	110	43	15
Indian Tamils								
1966—70	4618	538	336	239	177	107	46	19
1971—75	4401	413	295	243	179	100	48	15
1976—80	4951	379	350	267	191	111	50	21
Moors								
1966—70	6382	635	424	330	255	154	75	38
1971—75	5530	535	383	289	214	131	59	30
1976—80	5270	440	373	284	201	116	54	26

Appendix Table 9: Singulate mean age at marriage and age-specific proportions currently married by ethnicity: 1971 and 1981 (proportions in per cent)

Ethnicity and date	SMAM	Age 15—19	20—24	25—29	30—34	35—39	40—44	45—49
Sinhalese								
1971	23.9	8.6	42.8	70.7	85.0	89.1	88.3	85.8
1981	24.7	9.3	42.3	66.4	79.9	85.1	85.9	84.6
Low-Country Sinhalese								
1971	24.6	7.2	37.5	66.1	82.9	88.0	88.0	85.3
1981	25.2	8.5	39.2	63.0	78.1	84.0	85.6	85.0
Kandyan Sinhalese								
1971	23.0	10.5	50.5	77.7	88.1	90.8	88.8	86.6
1981	24.1	10.3	46.1	70.6	82.3	86.7	86.4	84.1
Tamils								
1971	22.8	13.1	51.4	79.0	88.4	90.1	87.6	83.1
1981	23.8	11.4	46.5	72.4	84.1	87.4	85.7	82.4
Sri Lanka Tamils								
1971	22.5	15.1	53.5	79.6	88.7	90.8	88.2	83.4
1981	24.0	11.1	44.7	70.9	83.8	87.3	86.3	83.5
Indian Tamils								
1971	23.1	10.6	49.2	78.4	88.0	89.4	86.8	82.8
1981	23.2	11.9	50.8	75.8	84.7	87.5	84.4	79.9
Moors								
1971	20.8	21.1	64.9	88.5	90.5	90.0	84.1	78.4
1981	22.6	15.4	53.1	78.2	87.3	87.8	84.5	78.0

PARITY PROGRESSION AND BIRTH INTERVAL ANALYSIS IN SOUTH ASIA

GRIFFITH FEENEY AND MALA WIJEYASEKERA

Parity progression analysis as an approach to the measurement of fertility was proposed by Henry in his remarkable 1953 monograph. Recently it has been shown that parity progression ideas may be extended beyond the measurement of fertility to the formulation of population dynamics (Feeney 1983). The result is a complete, formal alternative to conventional age-based approaches to demographic analysis.

We have been exploring the application of parity progression methods to the analysis of birth history data from fertility surveys. We are interested in measuring fertility trends, which depends in practice on our ability to analyze errors and biases, and in understanding the influence of family planning programmes on these trends.

This paper is a progress report. The following two sections outline the essential ideas of parity progression analysis. We then apply these ideas, first to the estimation of fertility trends, then to the analysis of family planning program effects.

The Idea of Parity Progression

Think of fertility as a sequence of events. A woman is born, is married, has her first birth, then her second birth, and so on. To measure fertility, consider the progression of women from one event to the next. Of all women born, how many ever marry? Of all women who ever marry, how many have a first birth? Of all women who ever have a first birth, how many progress to a second birth? The answers to these questions may be expressed as proportions or percentages, for example, "90 per cent of all women who have a first birth eventually have a second birth." These statistics are called parity progression ratios.

Parity progression ratios measure ultimate progression. We can also ask, for the women who do progress, how long they take to do so. How long between the birth of a woman and her first marriage? Between marriage and first birth? First and second birth? The answers to these questions, considered in the aggregate, are birth interval distributions.

Parity progression ratios and birth interval distributions may be subsumed into the more general concept of a parity progression schedule, defined as the function that gives the proportion of women, in any group of women who have had a birth of a given order, who progress to a next birth within any given number of years in parity (Feeney 1983). The shape of the parity progression schedule defines the birth interval distribution, and its limiting value gives the parity progression ratio.

Parity Cohorts and Parity Populations

It is well known that although life table statistics may be formally calculated for any group of deceased persons, the result makes sense only if the group is suitably chosen. Thus life table functions calculated from the ages at death of persons in a birth cohort make sense, but functions calculated from the deaths occurring in a given year do not—unless the population is stationary. The group for which the statistics are calculated affects their significance quite as much as the formulas defining the statistics, and the fundamental group specification is the birth cohort.

The same holds true for parity progression statistics, but here there are three fundamental group specifications, birth cohort, marriage cohort and parity cohort. Thus the question "How many women who have a first birth ever have a second birth?" may be answered in three different ways, according to which group is chosen.

A parity cohort is simply a group of women who have a birth of a given order during a given time period. Consider for example a group of women who have a first birth in 1980. The parity progression ratio for this group is the proportion of women in the group who ever have a second birth and the 1-2 birth interval distribution for this group is the distribution of the women who do progress by the interval between their first and second birth.

As in the case of cohort life tables, these statistics cannot be computed until all the women who will ever progress to a second birth have done so and this means in practice that we may have to wait until 1990 or so to get an accurate reading of the parity progression ratio and birth interval distribution. The same problem arises in the study of mortality, of course, and is solved by introducing period life tables, which show the life table functions that would be observed in a hypothetical cohort that experiences current mortality conditions throughout the lifetimes of its members.

Precisely the same solution may be applied to the study of fertility, and we define period parity progression ratios and period birth interval distributions to be those that would be observed in a hypothetical parity cohort that expenses current fertility conditions. These fertility measures were proposed by Henry (1953).

This definition illustrates an important general principle. Given any population, the subpopulation of parity i women—women who have had exactly i children—

Prepared for the Conference on Recent Population Trends in South Asia, New Delhi, India, February 2—8, 1983. Revised March 8, 1983. This version, which incorporates minor corrections and amendments, supersedes the version d stributed at the conference. The first author is a research associate at the East-West Population Institute, East-West Center, Honolulu, Hawaii 96848 USA, the second author a former student in the Department of Sociology at the University of Hawaii.

may itself be regarded as a population. We refer to such population as parity populations.

Familiar demographic concepts have analogues in parity populations. Thus women enter the population of parity i women by having an i-th birth, and this is analogous to birth. Women leave either by having an (i+1)st birth or by dying, and this is analogous to death by one of two causes of death. Parity cohorts are analogous to birth cohorts, duration in parity is analogous to age, and open birth interval distributions are analogous to age distributions.

Essentially all the familiar ideas of formal demographic analysis apply in parity populations, and from the technical standpoint, parity progression analysis is simply mortality analysis in parity populations.

As an example of this proposition, observe that the proportion of women who progress to a next birth within x years in parity may be expressed as

$$1 - \exp\left\{-\int_0^x \eta(x)\, d\, x\right\}$$

where $\eta(x)$ denotes the force of progression to next birth, or, equivalently, the instantaneous birth rate for women with x years duration in the given parity (compare Leridon 1977 chapter 2 and in particular table 2.1). This is the exponential formula for parity progression. It is simply the familiar relationship between the force of mortality function and the life table survivorship function, reinterpreted to apply to progression to next birth. The elaboration of this formula to take account of mortality is discussed in Feeney and Ross (1982).

Analysis of Fertility Trends

Period parity progression ratios may be readily calculated from fertility survey birth history data. For each parity i one tabulates women with i or more children by year of i-th birth and women with i+1 or more children by year of i-th birth and year of (i+1)st birth minus year of i-th birth. The first tabulation gives annual entries to the population of parity i women, and the second gives annual exits classified by year of last birth. One then calculates duration-in-parity-specific fertility rates for each year and translates these into parity progression ratios in the same way that one translates qx into lx values in the life table.

This calculation yields an annual time series of parity progression ratios for progression from first to second birth, second to third birth, and so on. These series may then be plotted on a single graph as a way of scrutinizing the fertility trends implied by the data.

Our rationale for looking at trends by parity was as follows. In many instances we expect a fertility decline, but we also know that the data are subject to error that may obscure or exaggerate this decline. A ten per cent decline in the TFR over five years is substantial by most standards, but a five per cent error in our estimates of the TFR would be rather good, and this level of error could seriously distort our estimate of a ten per cent decline.

We expect, however, that most fertility decline in high fertility populations will initially occur at higher parities. Thus if the TFR declines from seven to six, we would expect to see progression from say, fourth to fifth birth decline, but not progression from first to second birth or from second to third birth. And since we expect change to be concentrated at higher parities, we expect a greater change at these parities than we expect overall. If the TFR declines by ten per cent and the initial parity progression ratios stay essentially unchanged, then the higher order ratios must change by much more, perhaps by twenty or thirty per cent. Whatever the level of error, we have a much better change of getting a good reading on a change of this magnitude. Looking only at changes in the TFR makes the measurement job more difficult by mixing together information on the low parity women, whose progression is changing little, with information on high parity women, among whom the change is concentrated.

It was with these ideas in mind that we set out to examine parity progression time plots for a number of countries. The first results were encouraging. We found progression at lower parities to be essentially constant, and we found declining progression at higher parities, with the greatest declines occurring at the highest parities. (In practice, given the limitations of the data, the highest parity considered is around ten). But when we had looked at the plots for several countries, we became suspicious. Despite considerable diversity, in level of contraceptive use and in other factors, all the plots seemed to be showing the same pattern.

The similarity of the pattern could be explained by the "Potter effect." In the absence of hard information on dates of births, respondents and enumerators may invoke their preconceptions about birth interval lengths in the process of constructing the birth histories. This can result in systematic distortions of the time pattern of fertility. Potter (1977) has shown in particular how it can result in large, apparent fertility declines when fertility has not in fact been changing at all.

Incidentally, the parity progression approach would appear to be a particularly useful tool for studying Potter effects. One expects them to be most severe for long birth histories, which provide greater scope for distortion, and to be most pronounced (when the history begins with the first birth) for higher birth orders.

We thus have a sound basis for believing that the observed fertility declines *could* be spurious, but this in itself is hardly a satisfatory result. What we want to know, and with some confidence, is whether (in what cases, to what extent) they *are* spurious.

Pursuing this question, we have arrived at several conclusions. First, one would have to do a great deal of detailed technical analysis to exhaust the possibilities of the available data.

Second, given the available data, it is unlikely that this work would resolve the issue.

Third, it is essentially certain that the issues could be resolved if a second birth history survey were available. In the cases we have examined, birth history data was available from one survey only. Given a second survey, we would again calculate parity progression ratios and compare them with the values from the preceding survey by plotting both sets of values against time, both in absolute terms, and measured relative to the survey date. This overlapping of trends would leave little doubt whether the patterns we have observed are real or spurious. The technique was used by Potter (1977), and it is perhaps worth-noting that the idea of "overlapping" two retrospective time series has proven highly successful in a related area, the estimation of mortality trends from child survivorship data (Feeney 1982).

The fourth and last conclusion is that the sensible way to pursue the issue is to defer further work until further survey data become available.

This leads us to propose follow-up birth history surveys to the WFS surveys in those countries where fertility decline is an important issue and is in doubt. It has been half a dozen or so years since the WFS surveys were taken, and somewhere between five and ten years is probably the optimal interval between surveys for overlapping trends analysis.

This is not simply a routine recommendation for "more research." The synergism between the two surveys means that the second will far more than double the information available. Indeed, as we have indicated, we expect a second survey to provide as close to definitive evidence on fertility trends as we are likley to get.

Family Planning Program Analysis

Parity progression analysis is in many respects ideally suited to family planning program applications. Couples adopt family planning to defer or avoid a next birth, and in sofar as family planning programmes have the goal of reducing fertility, they must do so by reducing ultimate parity progression at higher parities. Setting target values for parity progression ratios thus provides a natural planning tool for operations and a standard for evaluation of impact.

Consider for example the population of parity three women. Each year this population grows by the addition of women who have a third birth during the year and shrinks by the subtraction of women who have a fourth birth during the year, or who die during the year. Under conditions of high fertility, most women will leave by having a fourth birth, and reasonably soon after entering. Under conditions of low fertility, most women will leave by dying, but only long after they have left the reproductive ages. Couples may use contraception to extend the woman's stay in the parity population, perhaps indefinitely.

From the standpoint of reducing fertility, contraceptive use among intermediate parity women has the strongest and most immediate effects. Use at very high parities is less important because few women reach very high parities, and because those who do have a relatively low likelihood of progressing to a next birth whether or not they contracept. Use at very low parities is less important because women at these parities are likely to contracept to space rather than to stop, and hence to progress to a next birth eventually whether or not they use. Thus in a population with a total fertility rate of five or six, we don't expect much fertility decline to occur as a reduction in progression from first to second birth.

Use among low parity women may nonetheless have extremely important indirect effects, for couples who acquire the knowledge and habits of (and lose resistances to) contraception by using it for spacing purposes at low parities are no doubt more likely to use it, and use it effectively, for stopping purposes at higher parities.

Focusing on any given parity, we ask three key questions. What proportion of women of this parity are using contraception? What proportion are progressing to a next birth? (Period parity progression ratios may be used to answer this question.) How will progression to next birth change if contraceptive use increases? The first question may be answered by contraceptive prevalence surveys, the second by birth history fertility surveys, and the third by looking at a time series of data addressing the first two or by indirect methods.

It is useful to think of this graphically by putting a vertical "parity progression ratio" axis against a horizontal "contraceptive use" axis and drawing in zero to one scale points on each. Every point in the resulting plane corresponds to a possible combination of contraceptive use and parity progression, and the idea is to identify the locus of points that might be observed.

Think of this locus as being made up of a family of curves representing possible relationships between contraceptive use and parity progression. We expect these curves to decline monotonically from a parity progression of close to one (less an allowance for non-progression under natural fertility conditions) for zero contraceptive use to zero (plus an allowance for failure) for universal contraceptive use.

This locus may in turn be thought of as defined by inclusion between an upper and a lower curve, representing extremes in efficiency of contraception. The lower bounding curve represents the greatest possible reduction in parity progression for any given level of contraceptive use, the upper bounding curve the lowest possible reduction for any given level of use.

What conditions of reproduction correspond to these two extreme situations? The two relevant factors are evidently (a) the extent to which potential fertility is concentrated among specific women and/or among specific duration in parity intervals and (b) the extent

to which this concentration is knowable by couples. Given high concentration and high knowledge, contraceptive use may be concentrated among couples in which the woman is most likely to progress in the absence of contraception, so that any given level of contraceptive use will reduce parity progression by a relatively large amount. Given low concentration and/or low knowledge, contraceptive use will be diffused over women who are less likely to progress whether or not they use contraception, so that the same level of use will result in higher parity progression.

The extent to which potential fertility is concentrated depends on several interrelated factors: the extent to which women are not at risk, as for example because they are pregnant, sterile, not fecund, or not exposed to intercourse; the shape of the schedule of duration in parity specific birth rates for the fecund, exposed women; the extent to which women know they are not at risk, or are less at risk; and the extent of heterogeneity among fecund women. Note that heterogeneity among women means that contraceptive use at low durations in parity can raise the birth rates that will be observed at higher durations in parity even in the absence of contraception at these higher durations.

A simple model for the effect of contraception on parity progression is given by

$$PPR(u) = 1 - (1-PPR)^{1-ku}$$

where PPR(u) denotes the parity progression ratio given that the proportion of women using contraception is u, PPR denotes the parity progression ratio in the absence of contraception, and k is a constant representing the concentration factors. The formula is simply derived from the exponential formula for parity progression noted above.

The graph of PPR(u) begins at PPR for u=0 and declines at an increasing rate to zero at the value of u that makes 1-ku=0. The rate of change of the parity progression ratio with respect to change in contraceptive use increase as k rises above one and declines as k falls below one. For values of PPR and k close to one and low levels of contraceptive use, the rate of decline is substantially less than one. Increasing contraceptive use from 10 to 20 per cent, for example, an increase of ten percentage points, may only reduce parity progression from 93 to 91 per cent, a decline of only two percentage points.

Thus the model suggests that it may be unreasonable to expect large fertility effects of contraception while contraceptive use is at low levels. Nonetheless, increasing use at low levels represents the building of a base necessary for larger effects at higher levels. The practical relevance of this is simply that one should not be discouraged by small declines in fertility in the early stages of a program.

Summary and Conclusion

Utilizing parity progression analysis methods, we have generated large numbers of tabulations, calculations and plots to measure fertility trends using fertility survey birth history data. We began with the hope that they would resolve the uncertainties that have arisen with conventional age-based methods. This proved not to be the case, however, and in retrospect perhaps the hope was naive. In any case, our efforts have led to further doubts about data quality rather than to confident conclusions about fertility trends.

Our principal conclusion on this score is worth repeating. In countries where fertility decline is an important issue and is in doubt, follow-up birth history surveys to the WFS surveys should be taken. Because of the synergism between two successive surveys, a follow-up survey far more than doubles the information available. We have indicated how a second survey could be analyzed to provide as definitive evidence on fertility trends as we are likely to get from birth history data.

We have suggested that parity progression analysis is in many respects ideally suited to family planning program applications. The focus on parity (the number of children a woman has borne), rather than on age, is a natural one in connection with birth control. Our results to date in this area consist entirely of ideas. Given the empirical traditions of demography, the impulse to apologize for this is very nearly overwhelming, but we shall resist it. We think the ideas are worthy of attention and pursuit, and that they will have their day in empirical work.

The more we have worked with parity progression analysis methods, the more we have become convinced that they represent a fundamentally important new direction in fertility analysis, and the more perplexed we have become that Henry's brilliant early lead was not followed, or has been followed as little as it has. The parity cohort concept has made occasional appearances in the literature since Henry's 1953 monograph (Poole 1973; Ryder 1975; Wunsch and Termote 1978, section 5.4), but we are aware of no empirical applications until very recently (Bumpass and others 1982; Rindfuss and others 1982; Rosero and others 1982; Willems and others 1981; Brass and his collaborators have a number of studies underway; *see* also the methodological monograph of Ryder 1981). Remarkably, Henry's monograph is cited in none of these works except the Wunsch and Termote text; we are not as yet conversant with the French literature on the subject. The diversity of this recent work suggests that the future of parity progression analysis may be brighter than its past over the three decades that have elapsed since Henry's pioneering monograph.

References

Bumpass, L. and others. 1982. "Intermediate Variables and Educational Differentials in Fertility in Korea and the Philippines," *Demography 19*, 241-260.

Feeney, G. 1983. "Population Dynamics Based on Birth Interval Intervals and Parity Progression." Forthcoming in *Population Studies.* March 1983.

Forthcoming. "Mortality Estimation from Child Survivorship Data: A Review," in Thomas M. McDevitt, Ed., *The Survey Under Difficult Conditions.*

Feeney, G. and Ross, J.A. 1982. "Analyzing Open Birth Interval Distributions", presented to the 1982 Annual Meetings of the Population Association of America, San Diego, April 29 to May 1.

Henry, L. 1953. "Fertility of Marriage: A New Method of Measurement," Population Studies Translation Series No. 3, United Nations, 1980 (French edition published 1953).

Leridon, H. 1977. *Human Fertility.* Chicago : University of Chicago Press.

Poole, W.K. 1973. "Fertility Measures Based on Birth Interval Data," *Theoretical Population Biology 4,* 357-387.

Potter, J.E. 1977. "Problems in Using Birth-History Analysis to Estimate Trends in Fertility," *Population Studies 31,* 335-364.

Rindfuss, R.R., and others. 1982. "The Transformation of Korea Child-spacing Practices," *Population Studies* 36, 87-104.

Rosera, L. and others. 1982. "Determinantes de la Fedundidad en Costa Rica," Direccion General de Estadistica y Censos, Costa Rica, and the World Fertility Survey.

Ryder, N.B. 1975. "Fertility Measurement Through Cross-Sectional Surveys, "*Social Forces 54,* 7-35.
—. 1981. "Progressive Fertility Analysis," typescript.

Willems, P. and others. 1981. "De Evolutie van de Vruchtbaarheid in Belgie, 1950-1980," Bevolking en Gezin, nr. 3, Centrum voor Bevokings-en Gezinsstudien, Manhattan Center, Toren H2, Kruisvaartenstraat 3, 1000 Brussel (Belgium).

Wunsch, G. J. and M.G. Termote, 1978. "Introduction to Demographic Analysis," *Plenum Press,* New York.

CENSORED COHORT PARITY PROGRESSION RATIOS FROM BIRTH HISTORIES

W. Brass and Fatima Juarez

Despite the progress of the past few years both in data collection and analysis techniques it is still difficult to establish convincingly that a quantum fall in fertility, consequent on control practices within unions, is beginning to be appreciable in a population. The more precise measurement of the size of the fall associated with such alterations in behaviour is obviously even more difficult. There are two quite distinct reasons for the difficulties. The first is the lack of sufficiently accurate and detailed data. The deficiencies of birth registration and, just as crucially, the capacity to estimate the related populations at risk are too well known to bear repeating. Reliance must usually be on birth history surveys of various kinds. But the problems are still considerable. The most obvious measures of recent fertility change, say the age specific fertility rates in the years before the survey, are particularly vulnerable to the errors in the location of the past births in time which have been a regular feature of maternity history surveys in exactly the kinds of population where the establishment of trends is most important. Even with quite large sample sizes (of the order of tens of thousands) the numbers of births in a year to women in a five year age group for a significant sub-division (for example those who have completed secondary schooling) will be small enough to have a substantial sampling fluctuation. If an attempt is made to study births by order—and it is suggested below that this is required for any incisive examination—the effects of sample fluctuations are even greater. The separation of the true from the response error features within the random "noise" depends to a large extent on models whose assumptions may be little more than speculation. Grouping over years is possible but awkward because of the increased censoring at later ages of child-bearing as the measures move further into the past. This is particularly acute if the birth histories are only obtained from women under fifty years of age—as in the World Fertility Survey and commonly in other inquiries. Even if the data are exceptionally reliable this censoring makes interpretation difficult. The specific fertility rates at the later ages of reproduction, where family limitation may be operating most strongly, are only available over a few calendar years.

The further reason for the difficulty of defining measures of significance is the concomitant changes in other demographic characteristics which often occur at the same time as the adoption of control practices. Increases in the age at marriage and reductions in the length of post-partum amenorrhoea are probably the most common confounding features but there are others such as shorter delays between marriage and cohabitation, changes in pre-martial conceptions and reductions in post-partum abstention, which may be important in some populations. The need to take account of such factors has been amply demonstrated, for example by Lesthaeghe and Page[1]. It has also been suggested that alterations in frequency of intercourse, either associated with some family planning use or due to unrelated social developments, for example in cohabitation, may further confuse the interpretation of fertility change. These confounding influences are most troublesome for the younger women but they may extend upwards towards the middle reproductive period (say 25—34 years) where alterations in the timing of lower order births may make it hard to detect the impact of trends at higher orders. That these are not isolated difficulties, confined to small aberrant populations in which the adoption of control practices has only marginally begun, is shown by the examples of Brazil and Indonesia. Despite much evidence of fertility falls over some fifteen years it has been hard to establish the size and nature of change.

The cumulated fertilities of cohorts are less vulnerable to these confusions but traditional methods can only deal adequately with total and (perhaps) first births. Thus the achieved fertilities at the same age for different birth cohorts (or at the same duration for marriage cohorts) will give direct comparisons less distorted by errors in the timing of events. But again the really significant trends are liable to be lost in the constancy or counter-movements of others. Thus fertility reduction at later ages of reproduction may be swamped in the cumulated measures and difficult to isolate from sampling fluctuations. In the middle ages of reproduction important tendencies towards a lowering of higher parity progression ratios will not show up if only a small proportion of the women have yet reached this stage of child-bearing. The logical answer is a more detailed examination by cohorts of the build up of families by marriage and births of increasing order with the aim of separating out the measures which are indicative of family control from the aggregates which may be influenced by other movements.

The technique for doing this is the life table analysis of birth intervals. The idea is far from new but practical issues have only begun to be examined recently. The particular strength of the life table approach is that it adjusts for populations at risk, *e.g.* the number of women in an age cohort of incomplete fertility who have experienced n births at different intervals before the survey. Hobcraft and Rodriguez[2] have proposed B_{60} as the key measure, that is the pro-

[1]There are several relevant papers in:

Page, H. J. and Lesthaeghe, R., *Child Spacing in Tropical Africa: Traditions and Change*. Academic Press, London (1981).

[2]See Rodriguez, G. and Hobcraft, J. N., "Illustrative analysis: life table analysis of birth intervals in Colombia". World Fertility Survey Scientific Report No. 16, London (1980).

20—5/RGI/ND/84

portion of women achieving the next higher birth order within five years of the previous one. The attempt is to find a measure as close as practicable to the parity progression ratio. But the latter can only be calculated precisely for cohorts of completed fertility. B_{60} is a good compromise since it is only modestly less than the parity progression ratio, at least for most populations of the type considered, but can be found for a considerable range of birth orders even for cohorts as young as 20—24 years. Because only a small proportion of births occur at more than five years from the previous one B_{60} approaches a pure measure of quantum. It is only marginally influenced by the changes in birth intervals which may be occurring for reasons other than parity alterations. Refined and valid comparisons can thus be made of trends by cohorts.

The life table analysis deals with the problem of censoring. However, as Hobcraft and Rodriguez have established the estimates are seriously biased by selection for speed of reproduction. In the cohorts of incomplete fertility birth orders reached by only a moderate proportion of the women who will ultimately achieve them are unduly dominated by mothers with short birth intervals. The B_{60}'s for them are, therefore, substantially less than would be found at the end of reproduction. The selective effect decreases with a rise in the ages of the cohorts and consequently extended inclusion of the slower reproducers. Hobcraft and Rodriguez suggest that controls can be introduced and give some alternatives. For some populations at least, these control methods do not seem too satisfactory. They have been thoroughly examined, using the WFS data for Mexico, by Fatima Juarez[3]. The most straightforward and effective is to sub-divide the women by age at earlier birth for any particular interval by order and calculate separate life tables for the sub-divisions. If the sub-divisions are narrow there are too many life tables, each based on too few events; interpretation is difficult if not impossible. If the sub-divisions are broad there will be residual biases. Hobcraft and Rodrigues suggest a four-fold division but for Mexico there are still appreciable residual biases which prevent a satisfactory assessment of significant trends. In addition some of the life tables are based on small numbers. It is, of course, possible to amalgamate the life tables over the sub-divisions with weights which are constant for all age cohorts and, thus in theory eliminate the selection bias. However, high sample errors occur in some of the most significant amalgamated life tables because measures based on small numbers enter with heavy weights. The standardized life table estimates of the B_{60} are then both biased and lacking in precision. A more elaborate form of covariate analysis would be required to eliminate the selection effects adequately, for Mexico at least, and it is far from clear how this could best be done.

There are great advantages of simple techniques both for convincing exposition of results and for extending the numbers and range of applications. It seemed worthwhile, therefore, to follow up a procedure which has been used for life table comparisons in other contexts. Its possible application for the present purposes was noted by Norman Ryder[4]. This is to make a series of comparisons between life table estimates for pairs of successive age groups with the reports of births in the past five years eliminated for the older groups in each case. The comparisons for pairs are then equally age censored and the selection biases made similar. It is possible that changes in age at marriage and birth intervals could make the censoring unequal in selection bias despite the age control but these distortions are likely to be very small for adjacent cohorts. Of course the additional censoring means that information, which might have been utilized in a more complex procedure, is discarded. However, the approach works neatly and effectively and as yet no practicable fully efficient procedure exists. The life table D_{60} values are calculated and compared for each pair of equivalent age cohorts. The trend is measured by ratios of the indices of the younger to the older cohorts. The series of ratios for a particular birth order can be multiplied successively for the 40—44 to 45—49, 35—39 to 40—44 and so on, age cohorts to give the cumulated effects. These can be regarded as the trend in the B_{60} by cohorts expressed as proportional changes. If the B_{60} at age 45—49 is taken as a starting point the cumulated ratios may be applied to it to give comparable estimates of the B_{60} for cohorts. The assumption implied is that the ratios of the B_{60}'s with equivalent censoring are equal to the corresponding unbiased ratios without censoring. Since the biases in the B_{60}'s are small, although highly significant for the detection of trends, this does not seem a strong demand.

It is possible that an even simpler method may give reasonably good results. The relation of the proportion of women with an nth birth who have gone on to an $(n+1)$st, p_n, to the B_{60} varies, of course, over the age cohorts because of censoring. In general, p is a little higher than B_{60} for older cohorts but substantially lower for younger. At ages near the end of reproduction, the p_n are in fact the parity progression ratios. For the youngest groups of women they are dominated by birth interval distributions. It is not easy to deduce how far the application to the p_n of the paired comparison procedure described above for the B_{60} will give useful estimates of quantum trends. If the birth interval distributions are constant over time the adjusted P_n should give the same results as the adjusted B_{60}. It seems likely that normal rates of change in the lengths of birth intervals will not bias the quantum trend estimates from the seriously if care is exercised over the interpretation of measures for the younger women. However, the specification of "normal" and "younger" here is not easy. A body of empirical evidence from the application of the method is required.

[3]In progress PhD research of Fatima Juarez at the Centre for Population Studies, London School of Hygiene and Tropical Medicine

[4]From comments at the Seminar on the Analysis of Maternity Histories, International Union for the Scientific Study of Population London (1980).

Fatima Jaurez has shown that the quantum trends estimated by the adjusted B_{60} from the World Fertility Survey data for Mexico, Colombia and Costa Rica are plausible and that the adjusted p_n give very similar results". In the present paper the World Fertility Survey birth histories for Sri Lanka (1975), Nepal (1976), Korea (1974) and Pakistan (1975) are explored. A substantive examination of fertility trends for any of these countries would require an extensive study of many measurements over time and cohorts. That is not the purpose of this paper. The aim is to determine whether the rather simple indices described give sensible and consistent estimates of trends in the build-up of families to different sizes, particularly in relation to the emergence of fertility control. In principle the methods can be developed to give estimates of the average completed family sizes of the group cohorts but this requires investigations outside the scope of the present study.

The summary indices of trends are shown in Table 1 for the four countries and plotted on the graphs in Figure 1. The uncorrected B_{60} are the life table calculations of the proportions of women in each age cohort who achieved a birth within five years of the preceding one. In the case of the first birth it is within five years of marriage. The adjusted B_{60} are obtained from the series of comparisons of the measures for adjacent age groups of women linked together by the cumulation procedure. The p_n values shown were adjusted in the same way. It should be noted that the base p for the oldest age group are negligibly different from the parity progression ratios except, perhaps, at very high orders where a few births might be added before the end of reproduction. For younger ages of women and higher birth orders the data base becomes small and the sample errors large. It is not easy to establish simple rules for cut-off points to ensure that the irregularities which may occur with the high random errors do not confuse the recognition of real trends. Assessment depends on the overall pattern and consistency of the measures and not on individual values which may be affected by both true and chance fluctuations. For most cohorts there is a sharp transition to a very small data base of tens of births at some order and the calculations are not continued. But the procedure was applied rather arbitrarily. The results for individual countries are discussed below to illustrate particular features of the analysis.

Sri Lanka, 1975

It is well established that fertility was falling for some time before 1975 when the WFS data were collected. However a part of that fall was due to increasing age at marriage and there remains some uncertainty about the characteristics of the change. The trends of Table 1A and Figure 1A are generally sensible and coherent. The uncorrected B_{60} trend to increase with younger age of cohorts for the first three birth intervals. At higher orders the measures are erratic but there is no sign of a systematic fall. The adjusted B_{60}' on the other hand, reveal a constant level over cohorts for the first two birth orders but steady decreases over time thereafter. The movement downwards goes back to the third and fourth births of the oldest cohorts and the reductions in the progressions to higher families continue steadily thereafter although erratic fluctuations prevent the precise determination of the time sequence. The rates of fall over cohorts are particularly sharp for the fourth to sixth birth orders and, perhaps surprisingly, slacken at higher orders. This may indicate variations in behaviour in different sub-groups of the population.

The p_n indicates are higher than the adjusted B_{60}' as they must be on the assumptions, since they are effectively estimates of the complete parity progression ratios. Biases and sample fluctuations can, however, destroy this criterion as for example with the second birth interval of women aged 20—24 years. The trends of the p agree quite well with those of the adjusted B_{60} but the former are slightly faster. It is difficult to accept that this is a genuine feature of the parity progression ratios, as compared with the B_{60}, particularly the decrease with cohorts in the P^2 that is for the second birth order, at the younger ages of women. It seems likely that this is a contamination from changes in tht birth interval distribution and that the Pn slightly exaggerate the reductions.

Nepal, 1976

All the uncorrected B_{60} increase as the cohorts become younger, for some intervals very substantially. Examination of birth orders four and above fails to reveal any systematic increase or decrease in the adjusted B_{60}'s. It is true that there is some sign of a fall for the younger cohorts for the seventh and tenth orders, but this is not confirmed for the sixth, eighth and ninth where, if anything, the tendency is in the opposite direction. Overall, then, the measures for the fourth order upwards, although somewhat unstable, support the view that there was no appreciable decrease in fertility due to family size control in Nepal prior to the survey date of 1976. The same broad conclusion is reached from the p_n for an equal to four and above although the measures are even more erratic than with the adjusted B_{60}.

The results at the lower birth orders are surprising. The adjusted B_{60} values show considerable increases as the cohorts become younger. The P on the other hand, although fluctuating, have only a slight tendency to rise with youth of cohort. These estimated parity progression ratios are close to one (as is to be expected in a high fertility population) and the slight rise brings some above this for younger age groups of women. Since true ratios over one are impossible the firm and plausible conclusion is that the quantum of family size building has remained constant. If this is so the behaviour of the adjusted B_{60} measures for birth orders of three and less is anomalous. A possible explanation for a trend upwards in B_{60} but not the parity progression ratio is shorter birth intervals due to restrictions in breast-feeding and hence post-partum amenorrhoea. The change would have to be large however to account for the trends for the second and third birth orders and is not applicable for the interval from union to first birth. The large difference of about 0.57 to 0.96 in the adjusted B_{60} and P_1 measures for the

first interval and older cohorts is presumably due to a delay between date of union and cohabitation. This delay could have been shortening over time. On the interval evidence the possibility that such changes in post-partum amenorrhoea and cohabitation customs account for the trends in the adjusted B_{60} cannot be ruled out. It seems more likely, however, that response errors are also operating, specifically a tendency for events (union and births) in the distant past to be recorded as more widely separated than was actually the case.

Korea, 1974

From the fourth birth onwards the uncorrected B_{60} tend to fall as the cohorts become younger apart from a few erratic values. The adjusted B_{60} show larger and systematic reductions. The fall in the quantum of build up of the bigger families is evident from the oldest cohort onwards but seem only to have moved down to the fourth birth order for the women born around 1935. The adjusted B_{60} for the third birth exhibit little trend but at the lower orders they rise substantially with younger age groups of women. The P_n measures fall at higher birth orders rather faster in general than the corresponding adjusted B_{60} and they also fall in the third interval.

The P_1 and P_2 series suggest that the first and second parity progression ratios remained constant over the period in contrast to the indications from the rising adjusted B_{60}. The relations between the P_n and the adjusted B_{60} are then much the same for Korea as for Nepal in form although the two countries differ, of course, in the levels and trends of the parity progression ratios. The reality of the adjusted B_{60} trend for the first birth is even more difficult to believe than that for Nepal. It must be concluded that the configuration is primarily or entirely a consequence of response errors. The fall in the P_3 as opposed to the constancy of the corresponding adjusted B_{60} suggests the possibility that the latter is biased also and should have recorded a reduction for the third birth. Despite the slight residual uncertainty a consistent and reasonably accurate picture of the trends in the quantum of fertility emerges.

Pakistan, 1975

The Pakistan indices of parity progression will be discussed only briefly because they demonstrate no new features of the approach and indicate a negligible change over time. The adjusted B_{60} measures increase with youth of cohort in the first interval. At higher orders there is a faint indication of a fall at the seventh and eighth births but only because of two individual values. Since the indices are fairly erratic little weight can be put on the suggestion. There is no evidence in the P_n measures which supports the idea that there has been any systematic change in the parity progression ratios over cohorts. At some birth orders there is a slight tendency for a rise, at others a fall. The overwhelming impression is of an essentially constant level influenced by erratic fluctuations which might be due to real, chance or response error perturbations. The relatively low adjusted B_{60} measures for the first interval are in accord with a gap on average between union and cohabitation. This gap may have been shorting to cause the trend upwards for the younger cohorts but small response biases of the type suggested for Nepal and Korea may be the explanation.

Overview of Four Countries

The applications re-inforce conclusions drawn from the examination of the Latin America surveys and bring out additional features. The success of the approach in delineating trends in the parity progression ratios of higher order births (say the fourth and above) is impressive. It should be noted that the relevant measures are based on events which occurred in the not too distant past, particularly for the critical middle age groups of women: the distortion from the time location errors is thus reduced. The simple, easily calculated P_n indices give much the same results as the more elaborate adjusted B_{60} but the former are slightly more erratic and vulnerable to bias for the younger women presumably because of the inclusion of effects from changes in birth interval distributions.

There is more uncertainty about the performance of the indices at low birth orders. Here the trends suggested by the P_n are mostly different from those implied by the adjusted B_{60} with the former clearly the more satisfactory as measures of the change in quantum. It is possible that the adjusted B_{60} are reasonably accurate in their precise specification, proportions of the women achieving the birth order within five years of the preceding one, but poor indicators of movements in the parity progression ratios. This could happen because of substantial changes in the birth interval distributions. More plausibly the B_{60} for the older women are seriously biased because of errors in the timing of distant events. In either case the P_n are the better indicators of quantum trends. Since they are not dependent on the time location of events and substantial proportions of even the younger cohorts (excluding the 15—19 years age group) have achieved the low birth orders, the P for small n are only sensitive to parity errors.

In theory even better results should be obtained from a series of adjusted B_c for each cohort and birth order with l taking such values as 60, 72, 84 months. The use of l intervals less than 5 years for the study of the distributions was, in fact, advocated by Rodriguez and Hobcraft[3] and applied in the analyses for the Latin American countries. It throws little, if any, further light on the quantum trends. For low birth orders the B_l for larger than 60 are calculable and approach more closely the parity progression ratios. They have the advantage over the P_n of more precise specification although it is doubtful whether there would be much gain in practice.

Two other issues which deserve further research are the choice of cut off points of cohort and birth order for the indices and the best ways of combining the measures to exhibit significant overall quantum trends. Since sample errors for the individual values are considerable, effectively combined indices would be more reliable and consistent.

Table 1: Indices of Trends in Parity Progression Ratios

A. Sri Lanka, 1975

	Interval								
	Union to 1st B	1st to 2nd B	2nd to 3rd B	3rd to 4th B	4th to 5th B	5th to 6th B	6th to 7th B	7th to 8th B	8th to 9th B	9th to 10th B
B_{ee} uncorrected										
20—24	.9417	.9234	.8446	.8272						
25—29	.9301	.8770	.8724	.8197	.8588	.8591	.6916			
30—34	.9238	.8708	.8426	.8297	.7678	.7251	.8275	.7614	.6785	.7785
35—39	.9142	.8775	.8503	.7785	.7969	.7727	.7923	.7515	.6419	.5979
40—44	.9143	.8723	.8277	.8043	.7822	.7743	.6920	.6601	.6731	.7410
45—49	.9191	.8528	.8406	.8305	.7982	.7742	.7093	.6913	.6795	.5311
B_{ee} adjusted										
20—24	.9107	.8508	.7542	.5972						
25—29	.9077	.8395	.7668	.6806	.6537	.6641				
30—34	.9147	.8570	.7851	.7357	.6665	.5928	.6709	.5471	.4304	.4967
35—39	.9129	.8734	.8248	.7429	.7465	.7059	.6642	.5931	.5092	.4359
40—44	.9143	.8706	.8174	.8003	.7668	.7473	.6531	.5826	.6158	.6541
45—49	.9191	.8528	.8406	.8305	.7982	.7742	.7093	.6913	.6796	.5311
P_n										
20—24	.9665	.7020	.7834							
25—29	.9370	.8420	.8047	.7271	.7010					
30—34	.9632	.9162	.8709	.8143	.7383	.6967	.6838			
35—39	.9637	.9424	.8843	.8379	.8298	.8191	.7284	.7573	.5627	
40—44	.9578	.9459	.9136	.8756	.8519	.8432	.7072	.7016	.6640	.6964
45—49	.9675	.9470	.9150	.9119	.8840	.8455	.7603	.7324	.7090	.5546

Table 1 : Indices of Trends in Parity Progression Ratios

B. Nepal, 1976

	Interval								
	Union to 1st B	1st to 2nd B	2nd to 3rd B	3rd to 4th B	4th to 5th B	5th to 6th B	6th to 7th B	7th to 8th B	8th to 9th B	9th to 10th B
B_{ee} uncorrected										
20—24	.6351	.9241	.9479	.8443	.8025					
25—29	.6613	.8894	.8930	.8857	.8746	.9288				
30—34	.6269	.8849	.8741	.8749	.8901	.8507	.8853	.8093	.7031	.3129
35—39	.6397	.8768	.8721	.8441	.8167	.8761	.8036	.7890	.7572	.8934
40—44	.5655	.8556	.8382	.8434	.7938	.8102	.7596	.7213	.7108	.5389
45—49	.5673	.8215	.8001	.8006	.7829	.7844	.7772	.6857	.5762	.5926
B_{ee} adjusted										
20—24	.6738	.8862	.8991							
25—29	.6670	.8636	.8449	.7837	.7435	.8167				
30—34	.6277	.8696	.8587	.7974	.7730	.7299	.6406	.6892	.5111	
35—39	.6415	.8712	.8551	.8183	.7415	.7865	.6903	.6942	.6411	.4434
40—44	.5655	.8531	.8336	.8309	.7712	.7814	.7120	.7126	.6074	.4196
45—49	.5673	.8215	.8001	.8006	.7829	.7844	.7772	.6857	.6762	.5926
P_n										
20—24	1.0399	.9738	.9282							
25—29	1.0487	1.0151	.9386	.9297	.9350					
30—34	1.0254	.9671	.9687	.9111	.9344	.7676	.6297			
35—39	.9749	.9532	.9525	.9219	.8383	.8759	.7482	.8090		
40—44	.9608	.9633	.9270	.9403	.8119	.8139	.7776	.7443	.6329	
45—49	.9583	.9648	.9142	.8991	.8642	.8278	.7993	.7169	.5732	.5555

DEM-130
N83
12-811

Table 1: Indices of Trends in Parity Progression Ratios

C. Korea, 1974

	Interval								
	Union to 1st B	1st to 2nd B	2nd to 3rd B	3rd to 4th B	4th to 5th B	5th to 6th B	6th to 7th B	7th to 8th B	8th to 9th B	9th to 10th B
B_{ee} uncorrected										
20—24	.9715	.9642								
25—29	.9717	.9489	.9393	.7134						
30—34	.9472	.9467	.8926	.7549	.6818	.6189				
35—39	.9230	.9146	.9011	.7604	.6525	.6138	.5747	.5427		
40—44	.8413	.8642	.8895	.8636	.7593	.6641	.5953	.4854	.4193	.5635
45—49	.8236	.8587	.8601	.8594	.8080	.7360	.6823	.5234	.4513	.4863
B_{ee} adjusted										
20—24		.9516								
25—29	.9732	.9277	.8563	.5848						
30—34	.9473	.9339	.8609	.6800	.5535	.4412				
35—39	.9234	.9060	.8896	.7455	.6037	.5659	.4748	.5145		
40—44	.8415	.8641	.8897	.8584	.7370	.6522	.5683	.4301	.3589	.4492
45—49	.8236	.8587	.8601	.8594	.8080	.7360	.6823	.5234	.4513	.4863
P_n										
20—24	1.0043	.9810								
25—29	.9865	.8997	.7727	.5866						
30—34	.9840	.9566	.8759	.7190	.5674	.4927				
35—39	.9896	.9706	.9341	.8114	.6878	.5938	.5041			
40—44	.9849	.9539	.9523	.9054	.7949	.6823	.6222	.5020		
45—49	.9836	.9681	.9529	.9292	.8511	.7792	.7086	.5773	.4706	

Table 1: Indices of Trends in Parity Progression Ratios

D. Pakistan, 1975

	Interval								
	Union to 1st B	1st to 2nd B	2nd to 3rd B	3rd to 4th B	4th to 5th B	5th to 6th B	6th to 7th B	7th to 8th B	8th to 9th B	9th to 10th B
B_{ee} uncorrected										
20—24	.8422	.9375	.9656	.9351						
25—29	.8431	.9112	.9330	.9339	.9147	.9374				
30—34	.8464	.9115	.9238	.9263	.9189	.9112	.8507	.9251	.9207	
35—39	.7778	.8860	.9040	.8994	.9017	.8730	.8772	.8286	.8193	.8322
40—44	.8072	.9143	.9206	.9066	.8701	.8545	.8737	.7518	.7437	.7384
45—49	.8094	.8962	.8740	.8781	.8855	.8179	.7977	.7442	.6793	.6156
B_{ee} adjusted										
20—24	.8454	.9215	.9026	.8771						
25—29	.8439	.8939	.8888	.8754	.8642	.8055				
30—34	.8456	.9009	.9096	.9031	.8685	.8270	.7390	.6980	.6682	
35—39	.7781	.8848	.8981	.8919	.8770	.8270	.8181	.6735	.6509	.6005
40—44	.8072	.9121	.9187	.9032	.8685	.8349	.8330	.6914	.6625	.6352
45—49	.8094	.8962	.8740	.8781	.8855	.8179	.7977	.7442	.6793	.6156
P_n										
20—24	.9309	1.0051	.9504	.7566						
25—29	.9475	.9879	.9326	.8915	.9173	1.0505				
30—34	.9611	1.0030	.9138	.9549	.9251	.9579	.8434	.6728		
35—39	.9567	.9863	.9513	.9339	.9452	.8798	.8513	.7193	.8186	
40—44	.9563	.9780	.9634	.9587	.9370	.9004	.8784	.7518	.7196	.6414
45—49	.9741	.9611	.9596	.9246	.9448	.8782	.8526	.7661	.7080	.6312

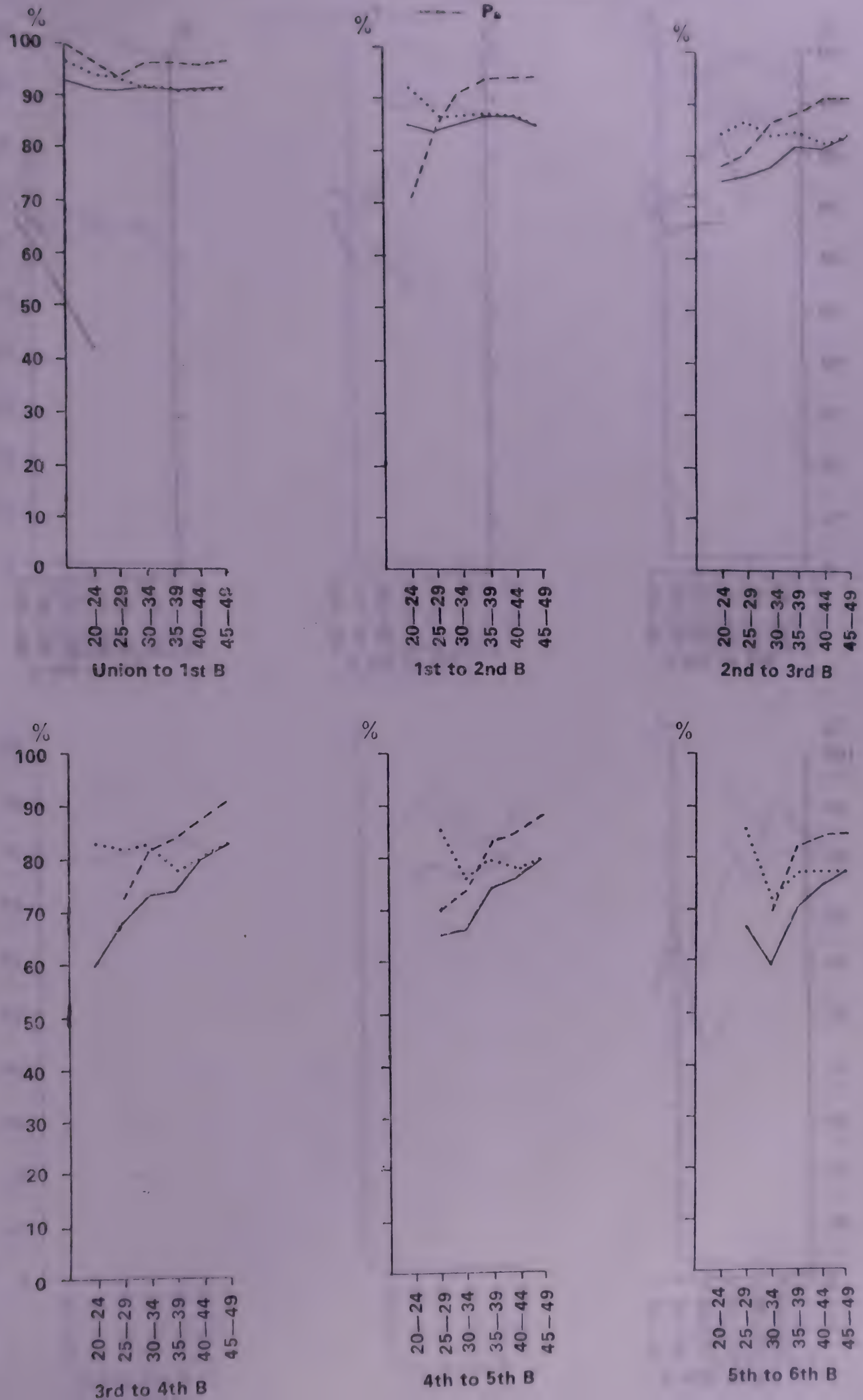
FIGURE 1 A

SRI-LANKA

B_{cc} (uncorrected)

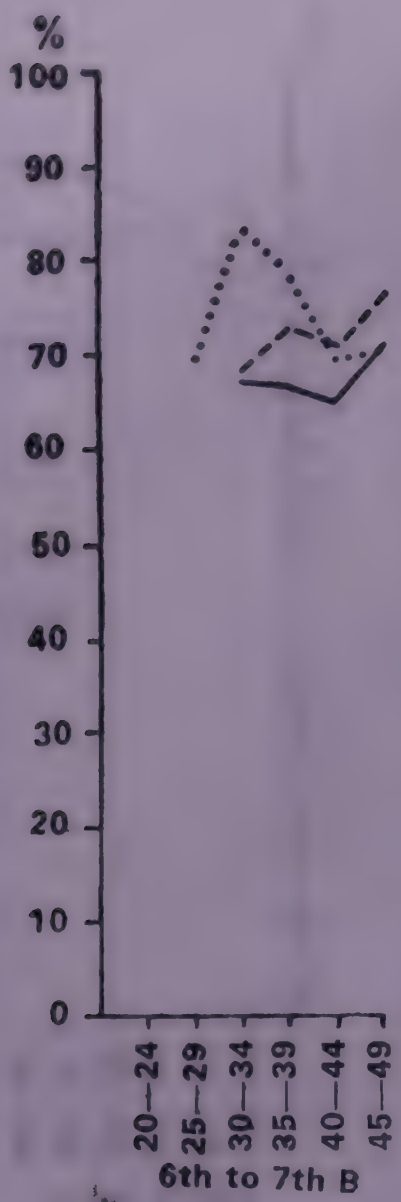
B_{cc} (adjusted)

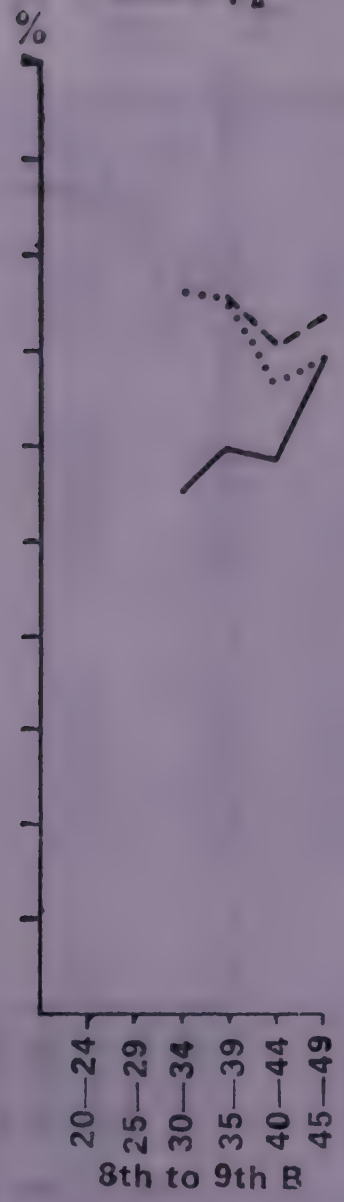
P_a

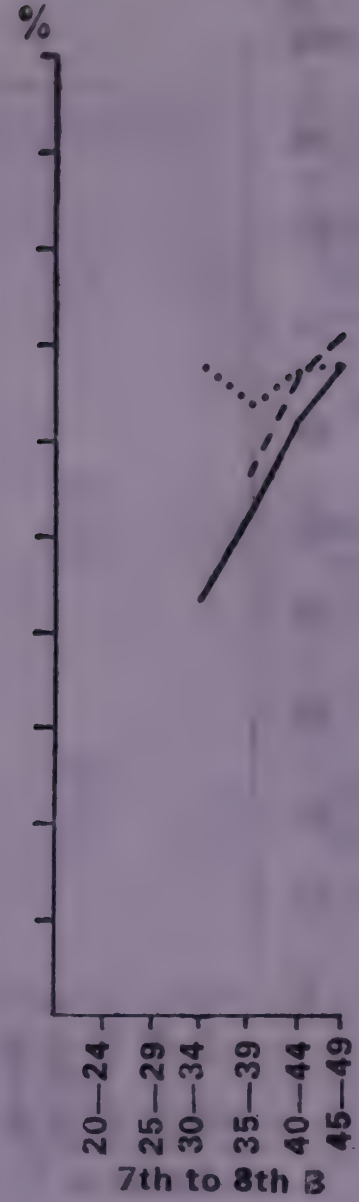


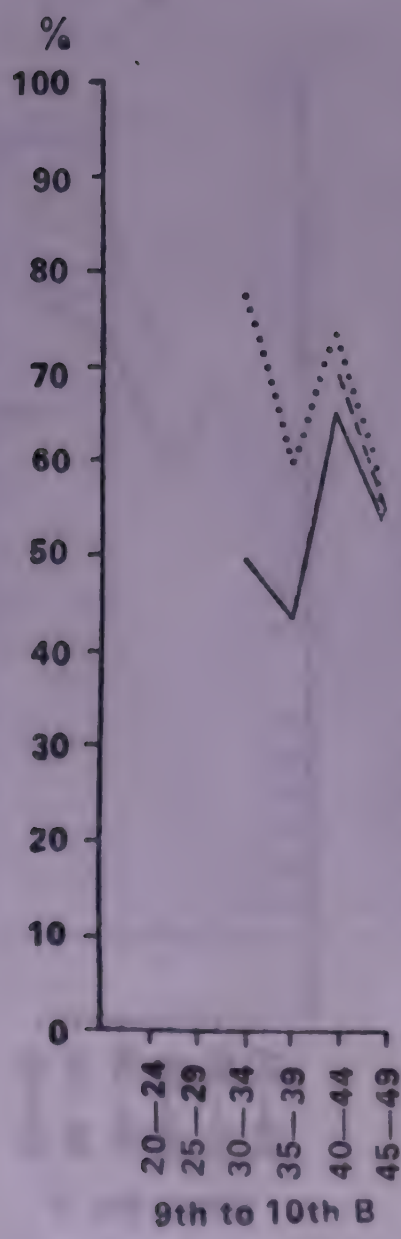
B_{ii} (adjusted)

P_{ii}





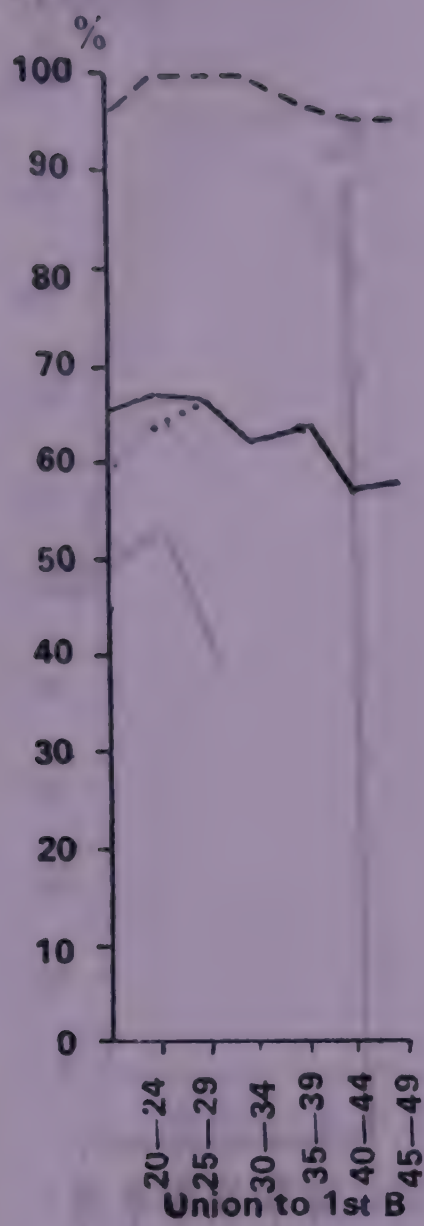


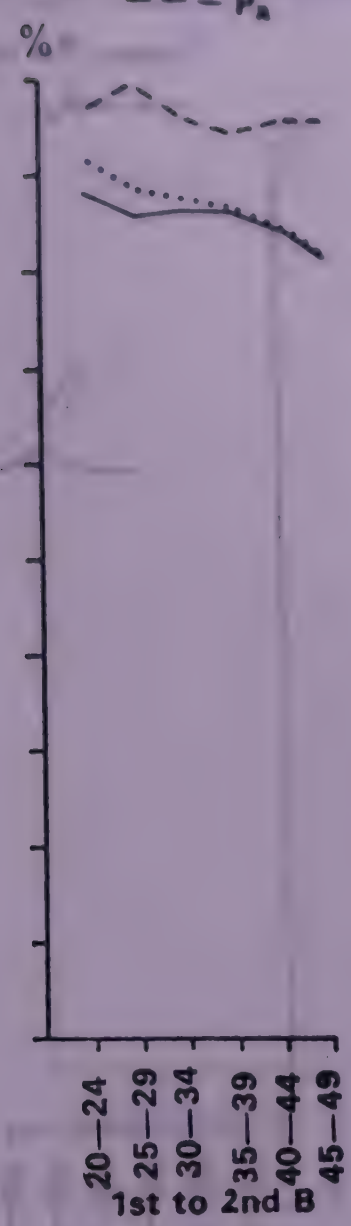


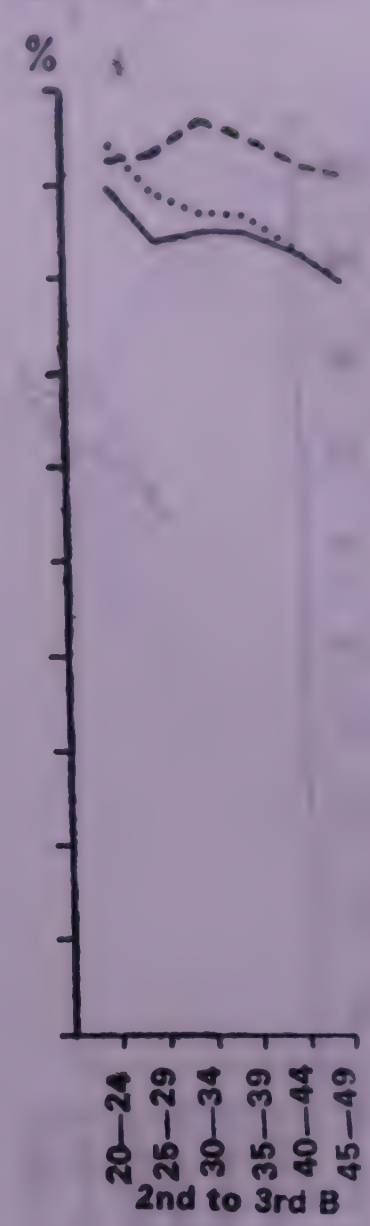
..... B_{x0} (uncorrected)

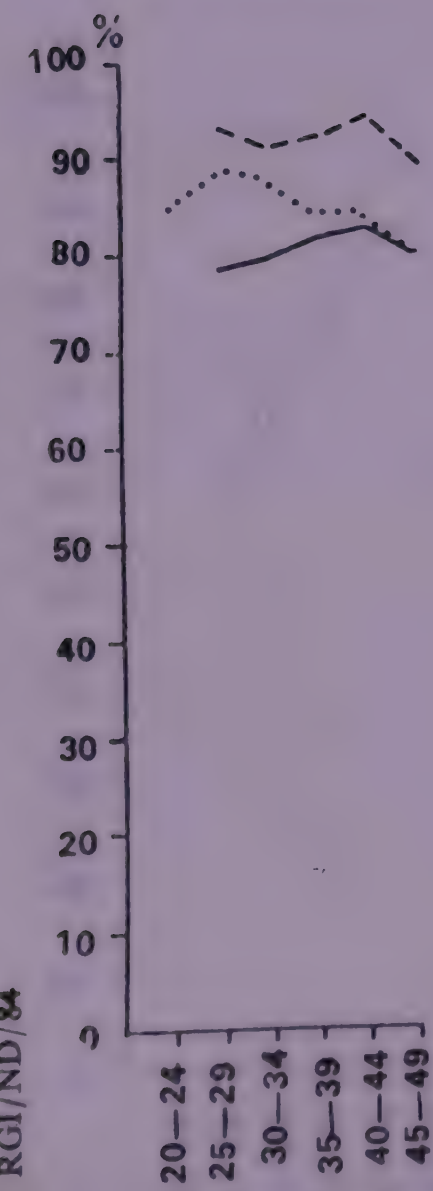
—— B_{x0} (adjusted)

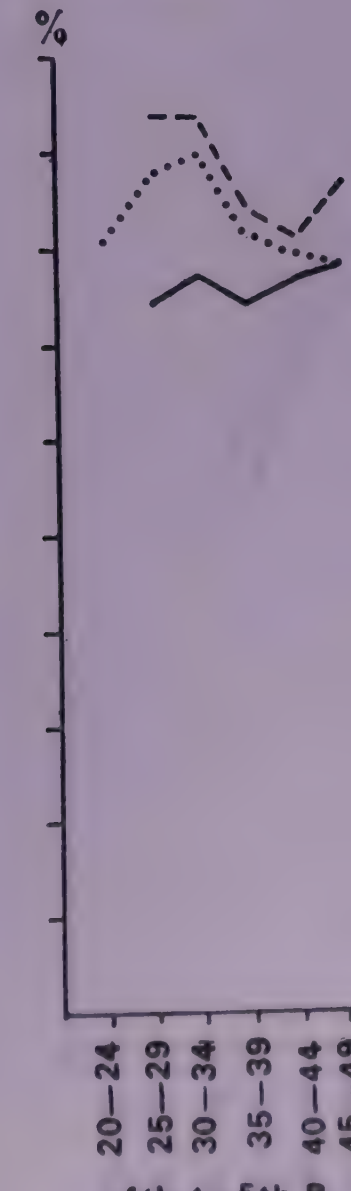
– – – P_x











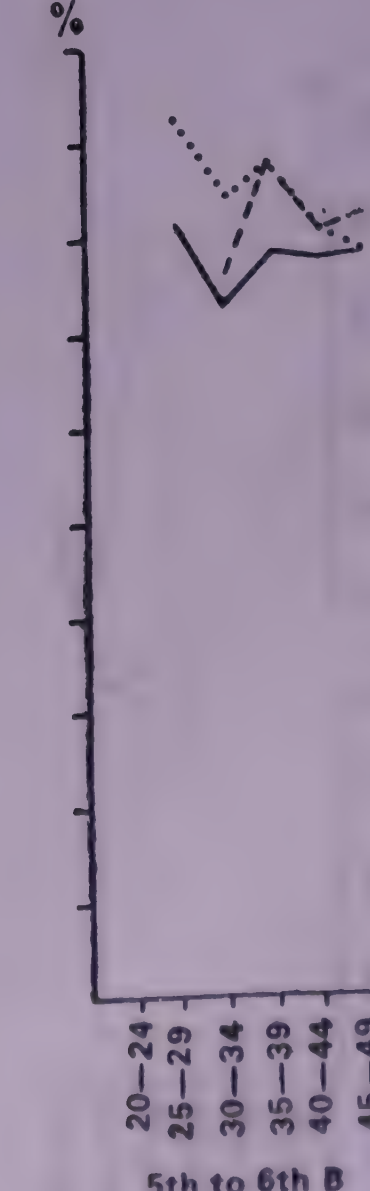


FIGURE 1 B (Cont.)

NEPAL

B_{60} (uncorrected)

B_{60} (adjusted)

P_2

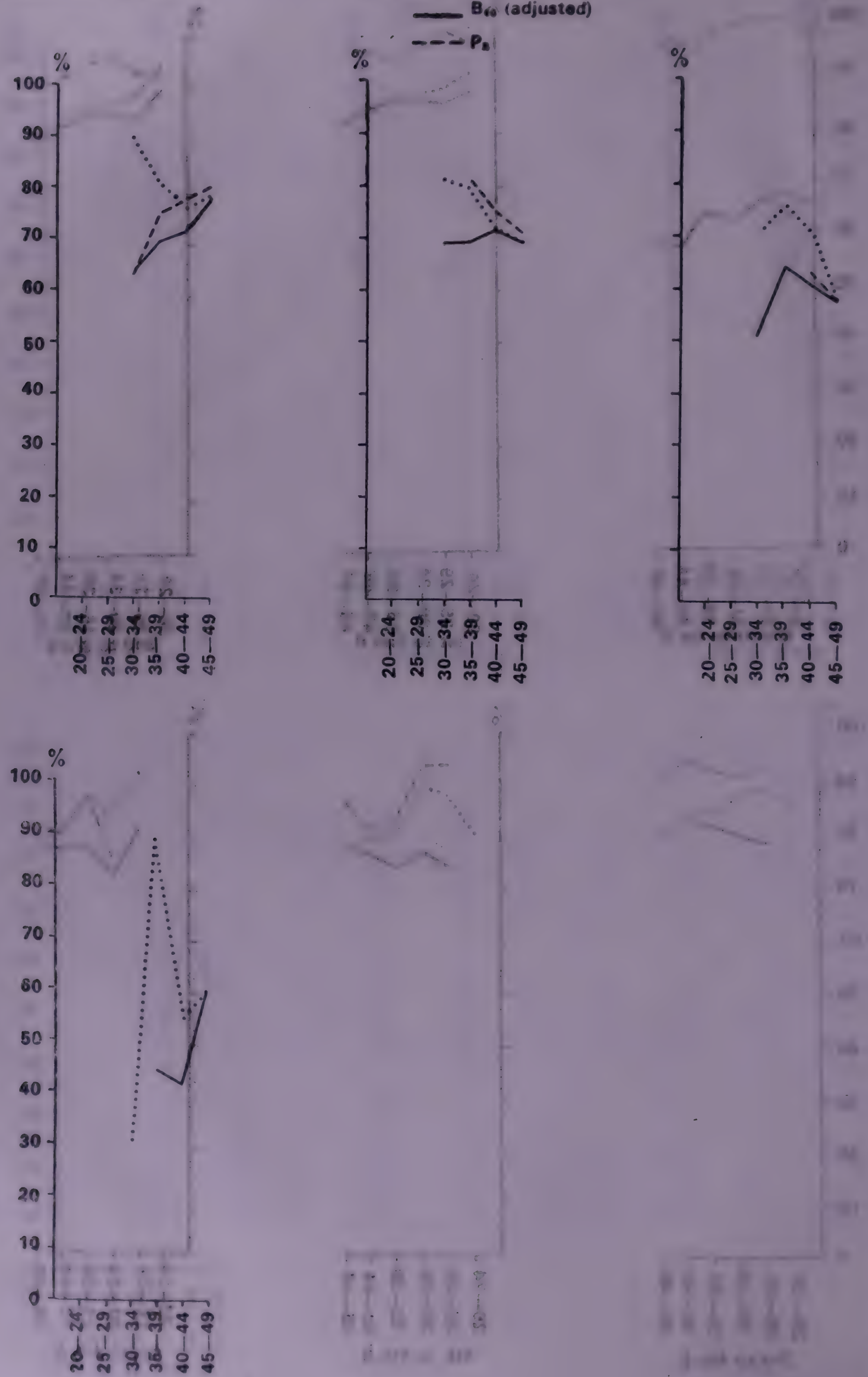


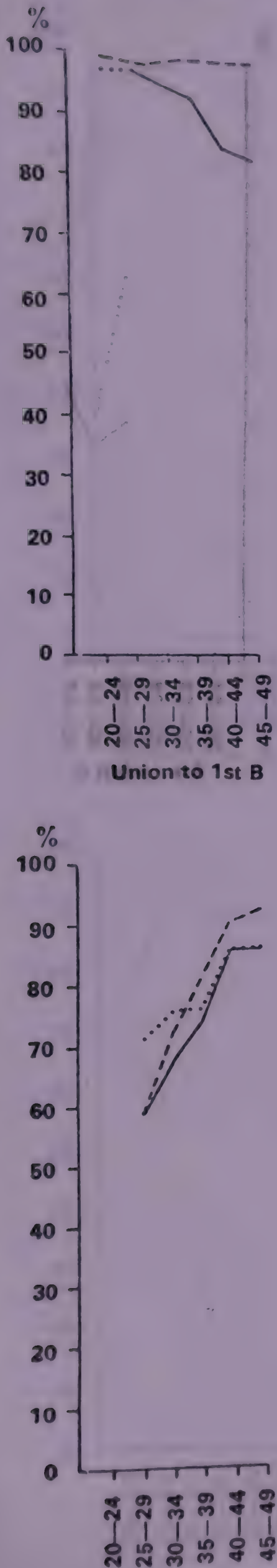
FIGURE 1 C

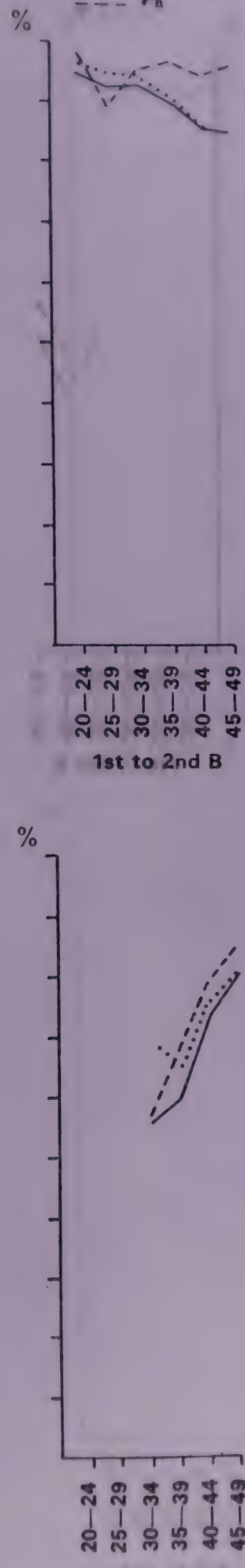
KOREA

B_{ee} (uncorrected)

B_{ee} (adjusted)

P_n





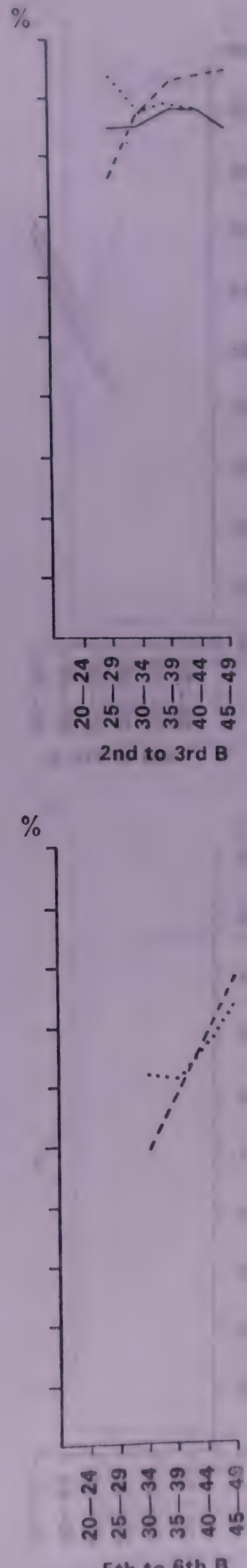


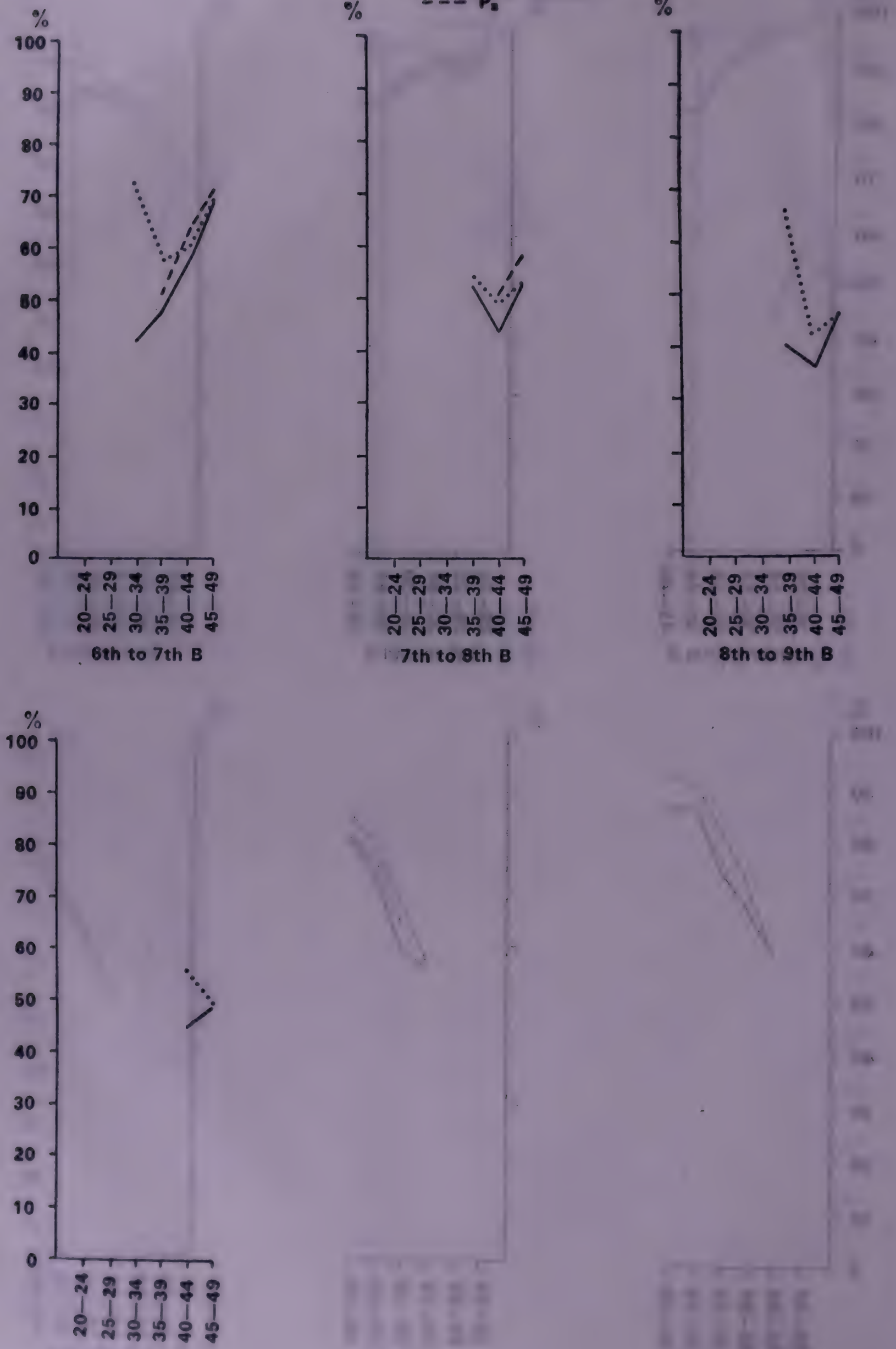
FIGURE 1 C (Cont.)

KOREA

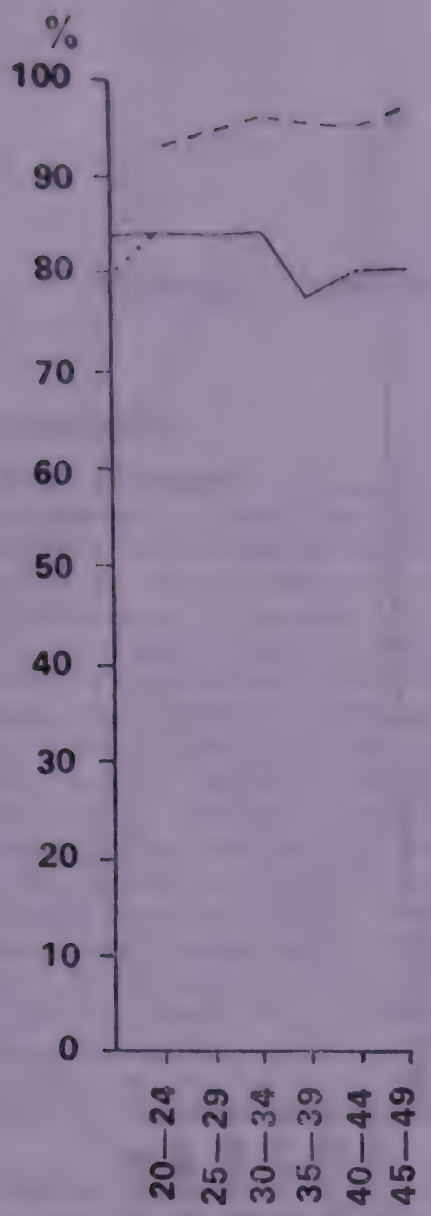
..... B_{66} (uncorrected)

—— B_{66} (adjusted)

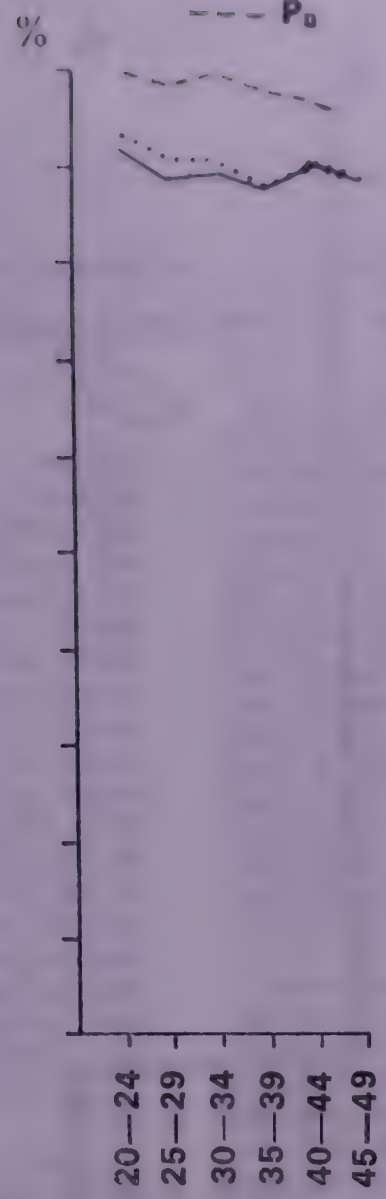
- - - P_3



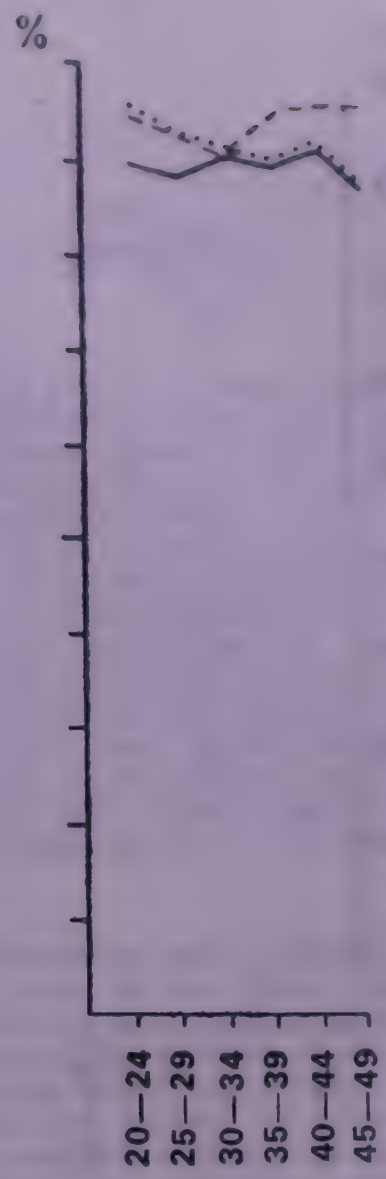
B_{t_0} (uncorrected)
B_{t_0} (adjusted)
P_B



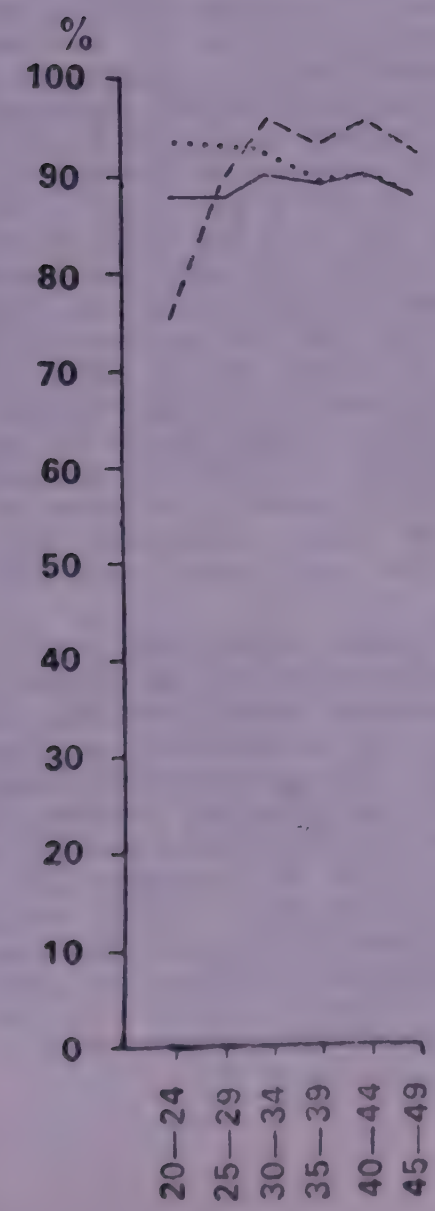
Union to 1st B



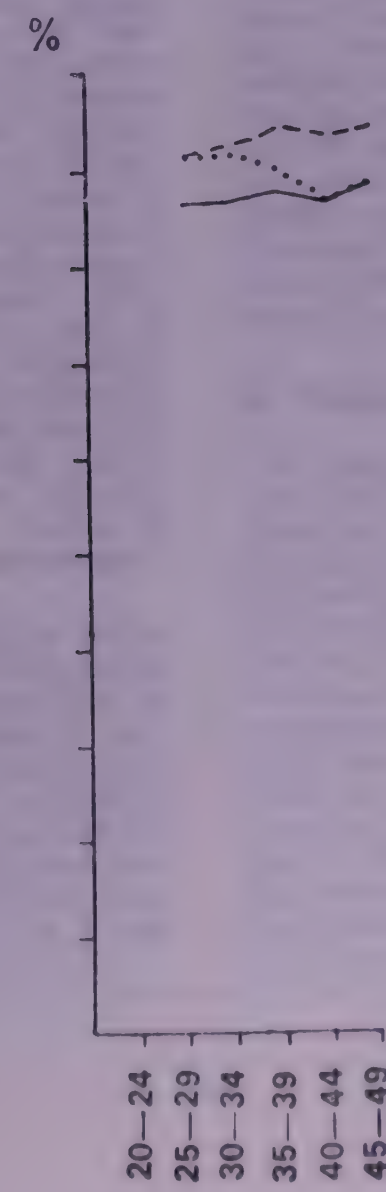
1st to 2nd B



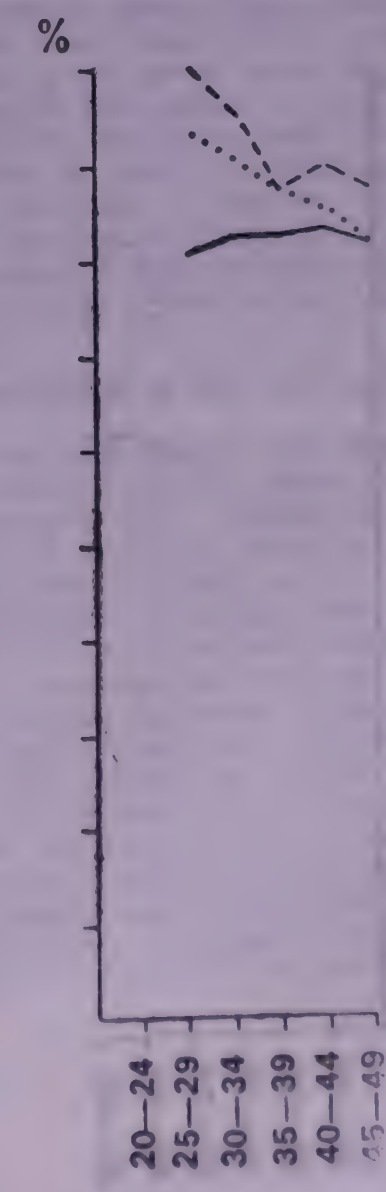
2nd to 3rd B



3rd to 4th B



4th to 5th B



5th to 6th B

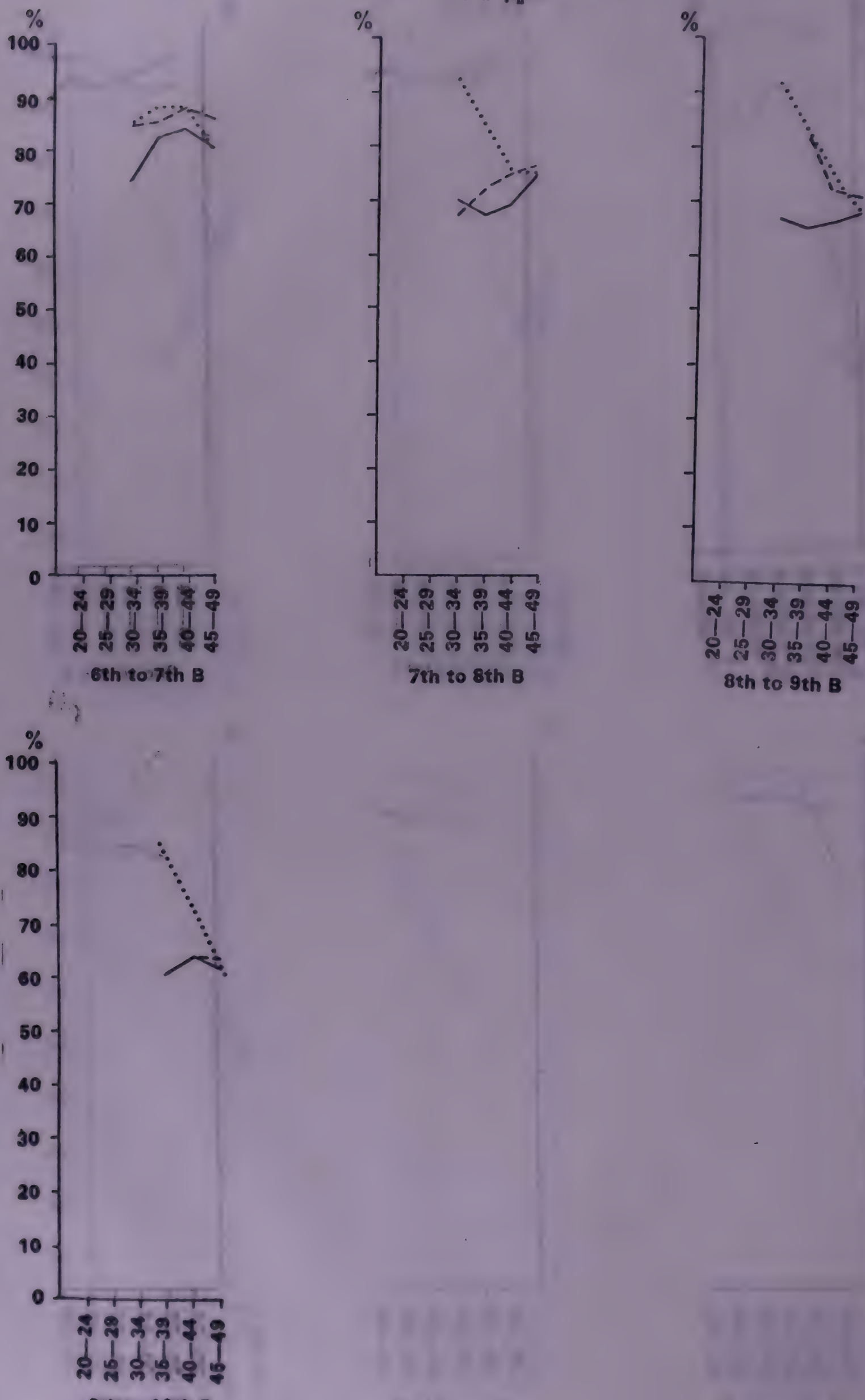
FIGURE 1 D (Cont.)

PAKISTAN

..... B_{40} (uncorrected)

—— B_{40} (adjusted)

– – – P_B



FERTILITY DIFFERENTIALS IN PAKISTAN : A COMPARISON OF TWO SURVEYS

MOHAMMAD IRFAN AND IQBAL ALAM

I. Introduction

While the rates of population growth have declined in a number of South-East and East Asian Countries (Mauldin, 1976) Pakistan stands as an exception. The most recent population census of 1981 indicates that the population is growing at a rate of around 3 per cent per annum (Census, 1981), suggesting no change in rate of population growth since 1961 (Afzal, 1974). Beside the population censuses, many other surveys have been undertaken to investigate the fertility, mortality, and rate of population growth, but the results have always remained debatable. It is being argued constantly that whether this rapid growth is the result of the decline in mortality levels accompanied by constant or rising fertility levels or is merely due to over-or under-enumeration in the censuses and the surveys. In the absence of an adequate vital registration system the debate has remained inconclusive. Recently some explanation to this puzzle, has however, been provided by the Pakistan Fertility Survey (PFS) conducted by the Population Planning Division in 1975.

One of the most important contributions of the survey was to document the fertility and Infant-Child mortality levels and to establish trends during the past 20 years. The data suggest a modest decline in total fertility, mainly in response to a rising age-at-marriage. But still fertility continues to be high and, on an average, a married Pakistani woman bears more than seven children during her fertile life. The precise extent of the decline however, was obscured by age mis-reporting and possible displacement by Children's date of birth (see Booth and Shah, 1983). Similarly, though infant and child mortality levels have declined considerably they are still very high: an infant mortality rate of around 140 (Alam and Cleland, 1983). More revealing was the fact that nearly one fifth of the births do not survive to their fifth birth-day. These conclusions are based on a single round survey and one should interpret them with caution. Recently, however, the PIDE in collaboration of with I.L.O. has conducted a repeat fertility survey as part of a bigger undertaking under the project "Studies in Population, Labour Force and Migration in Pakistan".

It is a multipurpose survey with a major objective to identify the set of factors bearing upon the productive and reproductive decisions of the households. In order to operationalize the objective, a set of four questionnaires dealing with Labour Force, Income and Expenditure, Migration and Fertility, was administered to every household in the sample. The details of the various aspect of the survey are discussed elsewhere (Irfan, 1981). The fertility module however, was exactly the same as was used in the PFS. For details of the two surveys see Appendix 1.

In this paper we have presented some preliminary comparison of the correlates of fertility observed in the two surveys. Multivariate regression analysis were conducted to gain insight into the kind and nature of association between cumulative fertility (CEB) and selected demographic and socio-economic characteristics of mothers and their spouses. In order to ensure comparability the same set of explanatory variables (see Appendix Table I) are specified for both the surveys. It must be noted that most of the variables suffer from reporting errors. In addition their temporal reference hardly corresponds to basic fertility indicators. Similarly, the limitations of the children ever born as fertility measures are well known. Our exercise thus carries all the weaknesses of a cross-sectional analysis of this nature.

Any study of the differentials beside suffering from the above mentioned errors, is also affected by the 'compositional' differences of the variables, if one is comparing data from more than one source. Most of the description in the paper is in terms of the differences in the sub-groups both at inter and intra variable levels. The sub-groups are defined by a number of characteristics, as specified in Appendix Table 1. One advantage of using the multivariate regression analysis is that it normalizes such compositional differences to a greater extent, at least within each set of data. However, it may hide some of the probable differentials while one is comparing more than one data set i.e., it is possible that similar statistics (S.E. and R^2) may have resulted from structurally different data compositions. Thus, in order to familiarize the readers about the comparability of the two surveys, in the next section, we have briefly discussed the socio-demographic characteristics of the population obtained before presenting the findings of multivariate analysis.

II. Background characteristics of the two surveys

It is generally observed that different socio-economic and other sub-groups in a population differ in their demographic characteristics. For example, the age structure in many of the developing countries differs substantially betwen urban and rural areas. When sub-groups show considerable variation in their composition, it is essential to control the demographic variables in order to classify the relationship between socio-economic factors and fertility behaviour. Further, it is likely that the background characteristics of the respondents are themselves inter-related; for instance; urban residence and educational achievement are usually associated with each other. We have looked in detail into the interrelationships between background variables elsewhere, here we have briefly examined the wider societal context within which any demographic change is

[1] For a detailed discussion *see* Alam (1983).

taking place over time. The two surveys have made possible a series of comparisons between the socio-demographic structure at two points in time.

Table-1 shows a comparison of the two surveys in terms of provincial distribution of the population. The regional distribution of the sample shows some major changes. The apparent reduction of the sample population living in Punjab is questionable, even though the 1981 population census does indicate some decline. The substantial gain in Sind is probably attributable to the rise in urbanization, nearly 40 per cent of the population in Sind is urbanized. The improved execution of the sample in Baluchistan and to a minor extent in NWFP in PLM survey, may have some effect on the coverage in these two provinces. In the absence of detailed information on non-response the possibility that the results are slightly distored due to non-response differentials across the provinces cannot be ruled out. It is, however, interesting to note that the age structure of the two samples is reasonably close, particularly at young ages (Table 2). Consistent with the expected pattern, the singulate mean age at marriage registered a rise from in PFS to in the PLM. This change is mainly due to rapid decline of young marriages and a rise in marriages at old ages 20+ (Table 3). The educational structure has remained nearly unchanged (Table 4). Table 5 shows the overall occupational structure of husbands in the two surveys. The only observable change is in service-related occupations. It should, however, be mentioned that some minor differences in the two occupational data arises from the fact that the PFS used the WFS occupational classification while the PLM used Pakistan standard occupational classification as the basis for defining the occupations.

An overview of fertility, the distribution of number of children ever-born by current age and parity, as reported in the two surveys is provided in Table 6. For the sample as a whole the mean parity is 4.2 in PFS and 4.1 in PLM, suggesting a modest decline in fertility. The means gradually rise by age from 0.6 and 0.4 child for women under 20 to 6.9 and 6.5 for women aged 45-49 in PFS and PLM respectively. Among the age group 30-34, nearly half (45 per cent) in PFS and nearly one third (32 per cent) in PLM have already born five or more children. At ages of 45 and over, two thirds of the women in the two surveys have 6 or more children. Nearly 14 per cent in the PFS and nearly 13 per cent in PLM were childless at the time of the survey, but the majority of them were under 20. After age 30 the incidence of childlessness remains nearly constant at around 4 per cent, a level of primary infertility to be expected in a healthy population.

Obviously in a Society where age at marriage is changing a better picture emerges when we compare the CEB for different marriage cohorts (Table 7), where again we observe some decline in fertility. Parity rises from an average of 2.5 and 2.4 births for those married for 5-9 years in two surveys, the PFS and the PLM, to 5.4 and 5.2 by duration 15-19. It is interesting to note that in both surveys there is an absence of any strong relationship between age at first marriage and fertility up until duration 15-19 years. In other words, the large differences observed by age are for young ages (under 35) and are mainly due to differences in marital exposure. However, the emerging differences at longer duration (20+) needs further investigation. At face value the figures suggest that older women in PLM are controlling their fertility, though the mechanism is obscure. The preliminary comparison of socio-demographic variables presented above has shown some structural difference between the two surveys. and the readers are cautioned to be careful in interpreting the results presented in the next section.

III. Correlates of Fertility—An empirical investigation

Examinations of the processes and factors bearing on fertility within households are based on the premise that fertility decisions are made at the household level. These decisions are however, taken within the context of the environment in which the household finds itself. The opportunities and constraints faced by the households, therefore, can hardly be ignored in any meaningful analysis of fertility differentials. In this paper which is a preliminary exercise, we will not deal with community or structural variables, although the sample is bifurcated along with the major demarcation line—rural and urban. In addition, some of the findings of the exercises currently being carried at more disaggregated level, wherein the influences of the variable such as tenurial relationships, child work schooling, income of the household, migration and presence or absence of schools and hospitals in the village are assessed, will be briefly discussed.

Identification of the exact causal processes between independent variables and fertility has very often proved a frustrating task. Notwithstanding its importance it is beyond the scope of this exercise which is geared to achieve the twin objectives of assessment of the nature of association between the explanatory variables and fertility and the specified of these relationships to a particular time period or a specific sub-group of the population. A comparison between the regression results of the two sets of data pertaining to different time periods will provide important evidence on the stability of the association between socio-economic and intermediate variables and fertility.

The Results

Regression results reported in the Appendix Table II-VI pertain to two sub-groups of females. The grouping of females is defined on the basis of whether they have completed their fertility or not. Since different age cohorts experience varying fertility patterns and the females who have completed their family size can be considered at an equilibrium position such a distinction is advisable. Regression results for all the currently married females are given in Appendix Table II while Table II, IV and V relates to females who do not want additional children and lie in the age brackets of 40-50 and 35-50

The results are occurring, a comparison of the PFS 1975 and the PLM 1979 results is suggestive of the stability of association between fertility (CEB) and the independent variables. Not only do most of the coefficients retain the sign but also their size hardly changes substantially. Intratemporal comparison across the population sub-groups, however, brings out some interesting findings, and are discussed below for the few selected major variables.

Age (AF)*

A non-linear relationship between current age of female and her fertility (CEB) is found for all currently married females (Appendix Table II). In case of females who have completed their family size and are aged between 40-50 years, we observe no significant association of age with children ever born (Appendix Table III), presumably because of the narrow range in CEB. For all currently married females the coefficients of both, the age and its squared term are highly significant and indicate a quadratic relationship with fertility. Interestingly, however, the age at which females in rural areas experience a decline in fertility works out to be later in PLM then PFS. Corresponding figures for urban areas are similar, though slightly lower. (equations 3-6 in Appendix Table II).

Age at Marriage : (A)

Female age at marriage bears a significantly negative relationship with fertility, in both the surveys and for rural and urban areas. The size of the coefficient is larger for urban areas than for rural areas suggesting that a unit increase in age at marriage will have a more depressing effect on fertility in urban areas than in rural areas. In comparison of the PFS and of the PLM suggests that either the associates of age at marriage have changed or the rising age at marriage in Pakistan has entered a zone of diminishing marginal returns.

For the females 40 years and above who have nearly completed their fertility, age at marriage bears a depressive effect. A sizeable diminution in the coefficients as compared to that of all the females is suggestive of the fact that some influence of late marriage may have been compensated by close spacing of the births. Its true for both urban and rural areas in both the surveys.

Education

Two different specifications, attendance of schools (SF) and education levels (EF_1—EF_3) are used to simulate the effect of education on fertility. An inverse association between the attendance of schools and cumulative fertility of currently married women is observed, though the relationship is significant only for urban residents. School attendance hardly yields any consistent relationship with the completed family size. The sign, size and significance of the coefficient depends on the presence or the absence of the regional dummies in the equations (Appendix Table III and V). A further exploration of female education and fertility is attempted by substituting the variable of school attendance with that of level of education. The result suggest that education has a non-linear relationship with completed fertility—Females having matric and above education do seem to end up having less children than those who have not attended school.

Male Schooling/Education

Like many other variables the relationship between male education and fertility is indeterminate a priori. Male school attendance bears a significant positive association with cumulative fertility of currently married females in rural areas in the PLM. In the case of the PFS no significant relationship can be traced. Similarly, completed family size appears to have no relationship with husband school attendance. Controlling for occupation of the husband presumed to reckon with the income effect associated with education, the higher level of education (Matric and above) emerges as a fertility depressant. In case of PFS however the relationship is not statistically significant (Appendix Table V).

Infant Mortality

Mortality bears a positive influence on fertility. The relationship is statistically very significant and is reflected by all sub-groups of females. The size of the coefficient of this dummy in case of PFS is twice that of the PLM. It can hardly be surmised that replacement factor has registered a decline. Probably the variable suffers from the specification error, the binary classification whether any child of two years or lower age died or not, is not very satisfactory.

Desires to have more Children and Contraceptive Use

For all currently married females, the association between desire to have additional children (AC) and the current level of fertility (CEB) is found to be significantly negative, both in urban and rural areas in both the surveys. Admittedly, the direction of causation is unclear. However, it tends to imply that females whose desired family size is not complete, would like to have more children. This raises serious doubts about the validity of cumulative fertility as a dependent variable in the analysis of fertility differentials.

Contraceptive Use

The use of contraceptives is found to be positively associated with cumulative fertility and completed family size. The coefficient is significant in all cases and in both the surveys. It appears that females opt for family planning practices only when they have relatively large number of children. In other words, the demand for contraception stems from the achieved fertility levels, which probably are determined by the prevailing fertility norms.

Labour Force Participation

Working females were not found behaving differently in their reproductive behaviours compared to those who do not participate in the economic activity. The employment status of the husband was also found to be

*Parenthesis are given symbol used in the Appendix Table to denote these variables.

unrelated to CEB. It must be noted, however, that the variable of work participation poses serious conceptual and measurement problems, and probably these hinder the assessment of the real effect.

Regional Differences

In our specification, as reflected in the tables, we found that the females living in NWFP have a higher level of fertility compared to the females of the other provinces. This finding is borne out by all sub-groups in both the surveys. The reasons for higher fertility in NWFP are not known and need to be investigated further. Consistent with the earlier findings (Sathar 1979 and Alam 1983) we found that the rural residence has a significant negative effect on cumulative fertility as well as on completed family size. The result is reflective of the fact that urbanism is not accompanied by the values, attitudes and job structure which are often considered anti-natalist, rather it appears that with the loosing of the kinship controls, the urban couples are adopting changing practices regarding breastfeeding, post-natal abstinence etc.

As already mentioned the PLM survey contains the data set which enables one to explore the fertility behaviours in the context of opportunities and constraints faced by the household. In order to reckon with the societal variables and the concommitant participatory capacity or the households in the economy the sample has further been disaggregated in farm and non-farm households in rural areas and metropolitan and non-metropolitan in urban areas. In addition vintage effect is being assessed by sub partitioning the sample in broad age groups of females 15-24, 25-34 and 35-50. Some interesting results are discussed in the following paragraphs though they are based on preliminary and rudimentary exercise.

Job Structure, Female Education and Fertility

Inter-connection between job structure, female education and fertility is gauged by disaggregating the total sample as discussed above. This classificatory scheme is expected to reflect the influence wieded by the availability of the kind of job on fertility choices. Accounting for job structure the female education turns out to be insignificant in both the rural subsamples. In case of urban metropolitan, higher level of female education (matric and above) was negatively associated with the cumulative fertility significantly but the same was insignificant in case of urban non-metropolitan areas. This tends to reflect that opportunity cost argument often invoked in the fertility-education discussion derives its relevance from the variable job structure.

Household Income, Child Quantity and Quality

Generally, in the analysis of fertility differentials, male education is regarded as a proxy for the income and the relationship is often rationalized by making a resort to child quality and quantity trade off. In our exercise, incorporation of a separate variable of child quality i.e. the proportion of children of school going age (5-14) enrolled in the educational institutions yields some insights. This variable turns out to be negatively associated with fertility in urban areas but looses its significance in rural areas though retains negative sign. However, the presence of this variable in the estimating equations, both the coefficient of the higher level of male education (EM_3) and household income turns out to be positive and significant latter though marginally.

Land and Tenurial Relationship

A further scrutiny of the relationship between fertility and land and nature of access to it, reveals that the reproductive behaviour of agricultural labour with no land and small-owners-cum-tenants is not different. Controlling the tenurial relationship, one finds a curvi-linear relationship between the size of holdings and fertility. In case of big land owners, the coefficient of land ownership turns insignificant. In the medium range land ownership (from 5 to 25 acres), the coefficients are significantly positive which may find an explanation from the enhanced value of children by the availability of land—a cooperant factor in the regime of self-employment being a predominant mode of labour market participation. In case of big landlords, the quality of children appears to be a dominating factor. Interestingly, the presence of tractor in the household registers a significant depressing effect on fertility. Presumably this reflects displacement of the potential labour because the variables like income land, and fathers education which influence the demand for quality of children are already controlled in the regression equation.

Concluding Remarks

The comparison of the two surveys conducted five years apart is suggestive of little variation in fertility, though contraception and nuptiality pattern appears to have undergone some changes. Notwithstanding the compositional difference between the two surveys the nature of association between the fertility outcome (CEB) and its correlates was found to be invariant to the time period of the survey or the sub-group of population. Not only this stability of association is heartening but the extension of analysis to the set of variable such as income, child schooling, land ownership and tractorization proved revealing.

Table 1: Regional composition of successfully completed interviews (Per cent Distribution)

Region	PFS	PLM
Punjab	65.5	61.2
Sind	24.2	26.4
NWFP	8.7	9.0
Baluchistan	1.6	3.4
Number of Women	4,996	10,098

Table 2: Distribution of Ever Married Women by Birth Cohorts
(Percentage)

Birth Cohorts	PFS	PLM
1925—29	10.2	..
1930—35	12.5	12.4
1935—40	12.6	12.7
1940—45	16.5	14.7
1945—50	18.4	16.6
1950—55	17.1	19.0
1955—60	12.7	17.3
1960—65	..	7.3

Table 3: Proportion Married by age at First Marriage

Age at Marriage	PFS	PLM
15	28.3	12.3
15—17	41.5	42.6
18—19	15.3	19.6
20+	14.9	25.4
	16.5	17.5

Table 4: Distribution of Ever Married Women and their Husband by Education Attainment

Level of Education	PFS		PLM	
	Wife	Husband	Wife	Husband
No schooling	89.3	58.8	89.2	61.5
Primary and less	6.7	17.3	5.1	12.8
Above Primary	4.0	23.9	5.8	25.8

Table 5: Occupational Structure of Husbands

Occupational Category	PFS	PLM
Professional	4.1	4.3
Clerical	3.7	3.2
Sales	10.9	10.4
Farmer and Agriculture Worker	42.8	42.8
Service Worker	7.0	4.8
Skilled and Unskilled	31.3	34.7

References

1. Alam, Iqbal, M. Irfan and NI. Farooqui, "Fertility Levels, Trends and Differentials in Pakistan : Evidence From the Population Labour Force and Migration Survey, 1979-80".
2. Alam, Iqbal and John Cleland (1983), "Infant and Child Mortality in Pakistan". World Fertility Survey London.
3. Afzal, Mohammad, (1974) '*Population of Pakistan*'. Pakistan Institute of Development Economics, Islamabad.
4. Booth, H. and Iqbal Alam (1980), "Fertility in Pakistan : Level Trends and Differentials" Substantive Findings Session No. 9 World Fertility Survey Conference, London.
5. Booth H. and Iqbal H. Shah : in (1983), "The Quality of Pakistan Fertility Survey Data", World Fertility Survey, London.
6. Irfan, Mohammad, 1981 "Studies in Population, Labour Force and Migration Survey, 1979-80". Pakistan Institute of Development Economics, Islamabad.
7. Irfan Mohammad & G.M. Farooq. "An Investigation of the Household Reproductive Behaviour" PIDE October, 1983.
8. Mauldin, Parker and Bernard Berelson (1976), "Conditions of Fertility Decline in Developing Countries : 1965-75", *Studies in Family Planning* Vol. 9(5).
9. Sathar, Zeba Ayesha (1979), "Rural-Urban Fertility Differentials 1975" *Pakistan Development Review* Vol. ( ).
10. Shah, Iqbal H. (1980), "Breastfeeding and Fertility in Pakistan", Substantive Findings Session No. 9, World Fertility Survey Conference, London.

OM_1= 1=if the husband is professional worker
0=otherwise

OM_2= 1=if the husband is a clerical worker
0=otherwise

R_1= 1=if the married woman belongs to the province of Baluchistan
0=otherwise

R_2= 1=if the married woman belongs to the province of Punjab
0=otherwise

R_4= 1=if the married woman belongs to the province of NWFP
0=otherwise

Table 6 : Percentage Distribution of Ever Married Women According to Number of Children Ever Born by Current Age

C.E.B.	< 20		20—24		25—29		30—34		35—39		40—44		45—49		Total	
	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM
0	56.0	66.7	19.6	23.7	8.5	8.0	4.5	5.2	4.5	3.6	4.2	4.7	2.9	2.1	14.1	12.7
1—2	42.6	31.6	48.4	55.9	24.3	31.7	12.7	13.4	8.0	9.5	5.5	7.3	7.5	6.0	22*7	23.3
3—5	1.5	1.7	30.1	20.2	53.4	53.1	38.5	49.9	26.0	33.2	18.5	27.1	20.7	23.5	29.2	33.2
60+	..	..	2.0	0.3	13.8	7.1	44.4	31.6	61.5	53.7	71.8	60.9	68.7	68.4	33.9	30.8
Mean	0.6	0.4	1.9	1.5	3.4	3.0	5.0	4.4	6.0	5.5	7.0	6.1	6.9	6.8	4.2	4.1

Table 7 : Mean Number of Children Ever Born by Ever Married Women, by Age at Marriage and Duration Since First Marriage

Age at First Marriage	< 5		5—9		10—14		15—19		20—24		25—29		30—	
	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM
< 15	0.65	0.66	2.35	2.31	3.83	3.72	5.32	5.07	6.25	6.39	7.08	6.53	7.05	6.64
15—17	0.58	0.61	2.54	2.31	4.28	4.05	5.57	5.12	6.99	6.00	6.89	6.36	7.46	6.68
18—19	0.66	0.66	2.61	2.46	4.46	4.22	5.97	5.67	6.74	6.56	6.00	6.58	7.42	6.85
20+	0.69	0.78	2.31	2.41	3.67	4.13	5.46	5.00	5.74	5.88	6.63	6.50	..	0.0
Means	0.63	0.67	2.45	2.37	4.06	4.07	5.44	5.17	6.52	6.12	6.90	6.45	7.16	6.68

Appendix 1

THE SURVEYS

The two surveys used nationally representative stratified two-stage probability sample. The sample represents all ever-married women aged 10-50 years living in private households in all urban and rural areas of the Punjab, Sind, North Western Provinces and Baluchistan[2]. The main strata were urban and rural areas across provinces. The urban population actually formed about 25 per cent of the study population but was considered to be more heterogenous than the rural population so 40 per cent of the sample was allocated to the urban areas.

In the PFS out of a total 5,246 household selected, 4,901 were successfully interviewed while in the PLM a total of 11,288 were selected and 10,244 were successfully interviewed which represents a completion rate of 93.4 per cent and 90.8 per cent respectively. The number of eligible females interviewed were 5,046 in the PFS and 10,098 in the PLM.

Field procedures were organized along similar lines in both surveys, with teams of supervisors and interviewers visiting different parts of the country. The 1975 field work was conducted between August to November 1975 and that of 1979 between July to December 1979. Both the surveys were conducted by teams with male supervisors and female interviewers. The main differences however, is that PFS was undertaken by Population Planning Division while the field work of PLM was entrusted to the Central Statistical Division.

The questionnaire used in the two surveys, was an expanded version of the World Fertility Survey core questionnaire. The questionnaire was divided into seven sections, with a cover sheet which contained information on identification of the sample household, and details about field and administrative controls. The first section solicited the information regarding respondent's background, i.e. present residence, type of place in which the woman lived in her formative years, age, literacy and education. The second section dealt with marriage history followed by a section on maternity history. Section Four collected the information regarding contraceptive[3] use and knowledge. In addition, two questions were added on abortion, one on use of induced abortion, the other on approval of such abortions, Section Five—Fertility Regulation and Exposure to mass media included beside questions on desire for more children, sex of the desired child number of additional children wanted, and knowledge about location of family planning clinic. Also a few questions were asked on availability and exposure to mass media. Section 6 obtained detailed occupational information about the respondents current or most recent work since marriage along with the nature of respondent's work before marriage. The last section collected information regarding background characteristics of respondent's current (last husband).

While in PFS an abridged WFS questionnaire was used to obtain the basic demographic characteristics (age. sex, marital status, relationship to head of household, residence status, literacy and education level) of the population in the selected household, in PLM such information was not collected in the Fertility Schedule. The selection of the eligible respondent was done on the basis of household informatiion collected in the migration questionnaire.[4]

---

[2] Due to inaccessibility, the geographic coverage of the sample was restricted. Excluded in the two surveys were : all the rural areas of Loralai, Zhob and Kharan districts in Baluchistan; the restricted cantonment areas; and the former states and tribal areas of the NWFP. Also excluded in PFS were rural areas of Kalat and Makran. The population covered by the sample thus represent 93.2 per cent in PFS and 93% in PLM.

[3] The procedure for collecting knowledge and use of contraceptive substantially different in comparison to the standard KAP survey procedures: Instead of reading out the family planning methods, the knowledge and use data were collected only for those methods mentioned by the respondent in response to an open-ended question on knowledge.

[4] This exclusion of household questionnaire in PLM has posed some analytical problems and is likely to bear upon the comparability of the fertility estimates such as ASFR's TFR, of the two survey.

Appendix Table 1

List of Variables

CEB= Children Ever Born

AF= Current age of married woman

AFSQ= Square of current age of woman

A Age at marriage of married woman

SF= 1=if married woman has attended school
0=otherwise.

SM= 1=if the husband of married woman has attended school

D= 1=if the married woman has experienced loss of infant age less than two years
0=otherwise

AC= 1=if the married woman desires an additional child

P= 1=if the married woman has ever participated in labour force
0=otherwise

DP= 1=if the married women currently pregnant
0=otherwise

U= 1=if the married woman belongs to rural area
0=otherwise

K= 1=if the husband is self-employed
0=otherwise

EUF= 1=if the married woman has ever used contraception
0=otherwise

EF_1= 1=if the married woman has achieved below primary level education
0=otherwise

EF_2= 1=if the married woman has achieved education from primary to matric
0=otherwise

EF_3= 1=if the married woman has achieved education above matric
0=otherwise

EM_1= 1=if the husband has achieved below primary level education
0=otherwise

EM_2= 1=if the husband has achieved education from primary to matric
0=otherwise

EM_3= 1=if the husband has achieved education above matric
0=otherwise

Appendix Table II

Regression results for currently married and married only once, for Pakistan and for Urban and Rural Residence, PFS 1975 and PLM 1979

Dependent Variable CEB

Variable	Pakistan		Rural		Urban		Rural		Urban	
	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM	PFS	PLM
Eq.	1	2	3	4	5	6	7	8	9	10
I	— 2.74	—2.203	—4.15	—2.226	—2.746	—2.581	—4.15	—5.187	—4.609	—5.80
SF	— .240	—0.300	— .27	—0.054	— .208	—0.312	—0.27	—0.016	— .160	—0.282
	(2.8)	(5.31)	(1.89)	(0.53)	(1.91)	(4.34)	(1.81)	(0.14)	(1.45)	(13.68)
SM	— .033	0.083	— .059	0.121	.012	0.020	— .049	0.123	.01	0.027
	(0.55)	(2.16)	(.81)	(2.54)	(.12)	(0.31)	(.66)	(2.36)	(.31)	(0.40)
AF	0.456	0.472	.427	0.440	.490	0.525	.487	0.553	.58	0.686
	(20.6)	(33.48)	(15.9)	(25.73)	(12.85)	(21.23)	(18.09)	(30.24)	(15.7)	(27.12)
AFS[a]	—0.005	—0.005	— .004	—0.005	— .005	—0.006	— .004	—0.005	—0.006	—0.007
	(13.6)	(24.31)	(9.94)	(16.50)	(9.06)	(15.65)	(10.8)	(19.89)	(10.83)	(19.39)
A	—175	—0.156	— .160	—0.132	—.201	—0.190	—.177	—0.175	—.22	—0.218
	(19.4)	(27.85)	(14.4)	(18.89)	(13.4)	(20.38)	(15.8)	(23.46)	(15.05)	(24.52)
D_3	1.89	0.865	1.88	0.871	1.835	0.860	1.882	0.876	1.83	—0.849
	(31.5)	(51.48)	(25.5)	(41.73)	(24.6)	(30.45)	(24.76)	(38.52)	(17.83)	(28.16)
DP	—0.003	—0.000	.078	—0.009	—.11	0.061	.147	—0.113	—0.05	0.061
	(.04)	(0.00)	(0.00)	(0.15)	(.90)	(0.73)	(1.51)	(1.65)	(.52)	(0.231)
AC	—0.871	—1.776	—.808	—1.850	—.94	—1.651	..	..	..	..
	(12.10)	(40.23)	(9.07)	(33.42)	(7.76)	(22.63)	..	..	..	..
P	—0.022	0.097	—.009	0.185	—.045	—0.093	—.009	0.059	—0.026	—0.102
	(.31)	(1.83)	(.00)	(2.98)	(.38)	(0.94)	(.104)	(0.87)	(.22)	(0.29)
U	—.12	—0.273	..	..	..	..	..	..	..	..
	(1.90)	(7.03)	..	..	..	..	..	..	..	..
K	0.065	0.088	—.057	0.612	.21	0.105	—0.037	—0.087	.238	0.108
	(1.17)	(2.48)	(.86)	(1.37)	(2.29)	(1.85)	(.53)	(1.79)	(2.56)	(1.79)
EUF	1.065	0.389	1.04	0.653	1.05	0.322	1.159	1.07	1.234	0.723
	(11.72)	(5.26)	(10.82)	(5.02)	(8.78)	(3.48)	(7.78)	(7.85)	(10.05)	(7.46)
R_2	0.205	—0.059	..	..	..	..	..	..	..	..
	(0.91)	(0.70)	..	..	..	..	..	..	..	..
R_3	—0.076	0.010	..	..	..	..	..	..	..	..
	(1.11)	(0.24)	..	..	..	..	..	..	..	..
R_4	0.19	0.400	..	..	..	..	..	..	..	..
	(1.72)	(6.57)	..	..	..	..	..	..	..	..
R^2	0.64	0.706	.64	0.704	.64	0.705	.635	0.648	.62	0.660
SE	..	..	..	..	..	..	1.90	1.766	1.99	1.795
F	592	1532.94	530	1281.137	304.94	794.474	530.95	1031.44	319.41	721.24
N	4952	9565	3043	5920	1909	3645	3043	..	..	..
DF	4936	9549	3031	5908	1897	3633	3032	5909	1939	3634

t—ratios are in the parenthesis.

APPENDIX TABLE III

Regression Results for Currently married and married only once Age 40-50, who are not Current Contraceptive and want no more Children for Pakistan and for Urban, Rural Residence, PFS 1975 and PLM 1979

Dependent Variable CEB

Variable	Pakistan		Total		Rural		Urban	
	PFS	PLM	FSP	PLM	PLM	PFS	PLM	PFS
I	10.21	7.535	10.62	7.494	6.650	8.15	8.305	13.72
SM	0.07	0.071	.09	0.056	+0.213	.115	—0.155	.058
	(.27)	(0.61)	(.34)	(0.48)	(1.37)	(.38)	(0.88)	(.144)
SF	—.39	—0.477	.447	—0.481	0.505	0.058	—0.585	—.67
	(1.07)	(2.36)	(1.2)	(2.38)	(1.10)	(.08)	(2.49)	(1.22)
A	—.15	—0.074	—.153	—0.075	—0.060	—.131	—0.105	—.13
	(3.99)	(4.87)	(4.07)	(4.08)	(3.24)	(3.11)	(4.07)	(2.36)
D_3	1.707	0.844	1.72	0.844	0.854	1.84	0.820	1.500
	(6.83)	(23.30)	(6.90)	(23.31)	(18.80)	(6.10)	(13.70)	(3.34)
P	.089	0.242	.045	0.205	0.357	.285	—0.058	—.305
	(.30)	(1.62)	(.15)	(1.40)	(1.98)	(.80)	(0.23)	(1.311)
U	—.257	—0.449	—.17	—0.462	..	..	.	.
	(.93)	(3.93)	(.64)	(4.13)	..	..	..	.
EUF	.518	0.506	.54	0.486	0.653	.534	0.464	.532
	(1.97)	(2.42)	(2.06)	(2.34)	(1.84)	(1.78)	(1.77)	(1.16)
K	.27	0.103	.265	0.065	—0.091	.08	0.273	.517
	(1.11)	(0.96)	(1.10)	(0.61)	(0.64)	(.23)	(1.71)	(1.17)
R_1	—.278	—0.339	..	..	..	..	.	.
	(.29)	(1.06)	..	..	..	..	..	..
R_3	.193	—0.151	..	..	..	..	..	.
	(.65)	(1.20)	..	..	..	..	..	.
R_4	1.24	0.351	..	..	..	.	.	
	(2.5)	(1.86)	..	..	..	..	..	
AF	—.023	0.004	—.032	0.005	0.008	.011	0.000	—.09
	(.62)	(0.30)	(.72)	(0.36)	(0.45)	..	(0.00)	(1.08)
R_2	.149	0.249	.14	0.246	0.247	.14	0.247	.13
F	7.31	55.33	8.89	72.399	49.241	6.65	33.374	3.89
N	433	1969	433	1969	1180	275	789	158
DF	420	1956	423	1959	1171	265	780	143

t- - ratios are in the parenthesis.

APPENDIX TABLE IV

Regression Results, PFS and PLM Sub Set : Currently Married and Married only once currently not Pregnant and do not want more children Age 35-50

Dependent Variable CEB

Variable	All Pakistan			
	PFS 1975	PLM 1979	PFS 1975	PLM 1979
I	5.435	6.191	5.64	6.196
SM	—.082	0.074	—.064	0.068
	(.46)	(0.79)	(.38)	(0.73)
SF	—.426	—0.553	—.457	—0.557
	(1.71)	(3.56)	(1.78)	(3.58)
A	—.159	—0.092	—0.158	—0.093
	(6.35)	(7.42)	(6.28)	(7.50)
D_3	1.869	0.844	1.88	0.844
	(11.45)	(27.63)	(11.80)	(27.67)
P	.317	0.160	.292	0.142
	(1.59)	(1.31)	(1.35)	(1.17)
U	—.254	—0.452	—.185	—0.457
	(1.36)	(4.91)	(1.24)	(5.08)
EUF	.447	0.453	.46	0.445
	(2.495)	(2.89)	(2.67)	(2.86)
K	.135	0.113	.149	0.085
	(.83)	(1.30)	(.94)	(0.99)
R_1	.174	—0.267	..	..
	(.22)	(1.03)	..	..
R_3	.235	—0.090	..	..
	(1.17)	(0.88)	..	..
R_4	.645	0.304	..	..
	(2.03)	(2.01)	..	..
AF	0.084	0.040	0.081	0.040
	(4.09)	(4.82)	(4.01)	(4.83)
R^2	.23	0.267	0.22	0.266
F	19.44	84.347	26.08	111.147
N	771	2743	771	2743
DF	758	2730	761	2733

t—ratios are in the parenthesis

Regression Results All Women Currently Married and married only once not Pregnant and want no more Children

Variable	Pakiastan 35-49		Pakistan 40-49	
	PFS 1975	PLM 1979	PFS 1975	PLM 1979
I	5.49	6.137	10.60	7.469
A	—.148	—0.038	—.14	—0.072
	(5.90)	(7.01)	(3.80)	(4.79)
D_3	1.86	0.842	1.707	0.841
	(11.34)	(27.62)	(6.81)	(23.24)
P	0.317	0.174	..	0.220
	(1.59)	(1.42)	..	(1.48)
U	—.12	—0.455	—.059	—0.477
	(.65)	(5.02)	(.21)	(4.12)
EUF	.469	0.455	.59	0.483
	(2.61)	(2.92)	(2 24)	(2.32)
K	.106	0 059	0.193	0.046
	(.63)	(0.67)	(0.77)	(0.42)
AF	.08	0.044	—.03	0.005
	(3.94)	(4.73)	(.83)	(0.34)
EF_1	—.905	0.051	—1.359	0.437
	(1.63)	(0.15)	(1.74)	(0.099)
EF_2	—.543	—0.487	0.12	—0.406
	(1.55)	(2.76)	(.21)	(1.71)
EF_3	—2.06	—1.559	2.062	—1.562
	(2.71)	(3.08)	(1.56)	(1.99)
EM_1	0.039	0.328	.233	0.370
	(.11)	(1.69)	(.43)	(1.59)
EM_2	—0.098	0.007	0.01	0.022
	(.47)	(0.07)	(.05)	(0.17)
EM_3	—0.127	—0.354	—.398	0.521
	(.388)	(1.45)	(.71)	(1.72)
OM_1	0.605	0.352	.683	0.199
	(1.56)	(1.67)	(1.10)	(0.76)
OM_2	0.295	0.107	.419	0.051
	(1.28)	(0.87)	(1.25)	(0.33)
R^2	.23	0.369	.146	0.250
SE	2.15	2.12	2.38	2.21
F	16.4	68.14	5.91	44.67
DF	755	2727	417	1953

INDIA'S DEMOGRAPHIC TRENDS : A REASSESSMENT ON THE BASIS OF 1981 CENSUS

K. SRINIVASAN

I. Introduction

In India, as in most of the developing countries, the publications of the results of decennial censuses are followed immediately by a phase of an increased tempo of activities among the demographers. The demographers within and outside India are interested to exploit the data, to the extent possible within the limits imposed by analytical techniques currently available, to discern a clearer picture of the demographic processes of fertility, mortality and migration underlying the population[1]. As experienced from earlier censuses, the findings from these analyses appear to have far reaching impact on the policies and programmes undertaken in the country for social, economic, health and family planning programmes. In developed societies, on the contrary, the publication of census results do not appear to be followed by such intensive demographic activities or policy impact. The availability of reliable data from vital registration records of births, deaths and marriages and other information available from records maintained for the social security purposes make it possible, in most developed countries, to maintain an almost continuous watch on the demographic processes taking place in the population. Owing to paucity of such registration data, policy-makers, planners and programme administrators in India depend more heavily on the Census results than in other developed countries. Census data have come to be the single, most important source of population and socio-economic data and their significance seems to be increasing with each successive census.

However, owing to the prevalence of various types of errors, including the errors of coverage and quality of information compiled from the enumerated individuals, the estimates obtained from the census cannot also be considered as highly reliable and are subject to various types of response biases and errors. Comparison of the data compiled over a series of censuses and collating them with data available from other sources, such as sample surveys, family planning service statistics and even vital registration records, make it possible to estimate with a degree of accuracy the underlying trends in vital rates of the country.

The preliminary results recently published from the 1981 Census provide only limited data on the total population count by males and females of different states, classified by rural-urban areas and literacy levels, which permit only limited analysis of the trends in fertility, mortality and migration[2]. Detailed information on the age-sex distribution of the population is necessary for the construction of intercensal life tables, which would represent the mortality picture in the decade 1971-81. Even the construction of such life tables call for data on age-specific migration rates which are again obtained from the censuses. From estimates of migration and mortality, the third component of population change, viz. fertility could be estimated using standard demographic techniques. Thus reliable estimates of fertility, mortality and interstate and international migration from the census data should await the publication of 'age-tables' and 'migration statistics'. From a knowledge of the total population count alone, on which information is available at present, it is only possible to construct alternate sets of fertility, mortality and migration rates consistent with the census figures, and one has to use some judgement to choose the most appropriate set.

However, the Sample Registration Scheme, operated since 1968 by the Registrar General of India, provides independent estimates of fertility and mortality rates by states since 1970 and it is possible to use these values, check their consistency with the 1981 Census count and make necessary adjustments on them in order to obtain improved estimates of the vital rates for the decade 1971-1981.[11] It is also possible to start with a given level of age specific marital fertility rates, as potential fertility levels, for each state and adjust them for family planning use in subsequent years, and make population projections with different levels of mortality. In these methods the information on one or more components of population change available from other sources and considered fairly reliable is used to obtain estimates for the other two components. In this chapter, an attempt is made to analyse the trends in the population growth rates by major states in India during the period 1951-81, using a projection model which will be consistent with '51, '61 and '81 census totals by age and sex, and consistent with the age sex marital status distributions of 1951, 61 and 71 Censuses. The analysis is undertaken with a view to study the broad trends in fertility and mortality taking place in the recent years in the country and their implications for growth of population in the next 20 years. The details of the projection models are available separately.

II. Trends in Rates of Growth

The annual rates of growth of population during the three decades 1951-61, 1961-71 and 1971-81 for each of the 17 major States of India (with a population of 4 million or more in 1971) and for the country as a whole that were computed from the census

[1]Two illustrations of detailed analysis following 1981 Census can be had from the Special Issues published by the *Journal of Family Welfare*, Vol. XXVIII, December 1981 and the *Economic and Political Weekly*, Vol. XVI, November 1981.

figures given in Table 1. These 17 states constitute 97.7 per cent of the country's population. The annual rate of growth for each decade was computed on the basis of exponential function taking account of the fact that while the censuses were conducted on 1st of March in 1951, 1961 and 1981[a], it was conducted on the 1st of April in 1971. Thus, while the period covered between the 1961 and 1971 Censuses was 10 years and one month, it was 9 years and 11 months between the 1971 and 1981 censuses.

It is to be realised that the rate of growth estimated from the two censuses really provides the average rate of growth prevailing in the population in the middle of the decade and when the rates of growth are changing from year to year, they cannot be assumed to be constant for all the intercensal years. The estimates of intercensal growth rates for the three decades 1951-61, 1961-71 and 1971-81 provide the average values prevailing around 1956, 1966 and and 1976, and assuming that there is an underlying trend of change in the growth rates, a second degree curve can be fitted to these three values and used to estimate the growth rate prevailing in the year 1981.[13] The assumption that the trends in the growth rates follows a second degree curve is justified from the experiences in a number of developing countries during the periods of their demographic transition, wherein the growth rates are initially low, rise to a peak with modernization and development and decline once again due to continuing modernization including extensive use of modern methods of fertility regulation. It can be seen from this table that the estimated growth rate for 1981 for the country as a whole was 2.17 per cent, compared to 2.23 per cent in 1976, 2.20 per cent in 1966 and 1.96 per cent in 1956. Thus, there is a trend of decline in the growth rate currently taking place in the country during the past five years. The analysis of data by states reveals that this declining trend in the growth rate of population is taking place in most of the states. The states which are still in the increasing phase of their growth rates (termed Group A States) are Assam (on the basis of the projected population, since the 1981 Census has not yet been conducted in the State), Bihar, Karnataka, Punjab, Rajasthan and Uttar Pradesh. The remaining 11 states have experienced varying magnitudes of decline in their growth rates since 1971. These can again be categorised into two sub-groups; Group B states, which include Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh and West Bengal, experiencing a less than 10 per cent reduction in their growth rates between 1976 and 1981, and Group C states, including the remaining six states (Jammu & Kashmir, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu) which have experienced more than 10 per cent reduction in their growth rates since 1976. The inclusion of the States of Karnataka and Punjab in the first group of states (Group A) with ascending growth rates, and Madhya Pradesh and Orissa in the third group of states (Group C) with more than 10 per cent decline in their growth rates during 1976-81 is really somewhat perplexing since these findings run contrary to the popularly held notions of interrelationship between population growth rates and socio-economic and health development. The dramatic decline in the growth rates of Madhya Pradesh and Orissa, which are still considered to be relatively far behind other states in terms of a number of development indicators such as infant mortality rates, female literacy levels and per capita income are inconsistent with known theories of demographic transition and hence quite unexpected results for planners and demographers. While the decline in the growth rate in Orissa is to some extent compatible with the excellent performance of family planning in the State, the decline in Madhya Pradesh finds no such justification. Similarly, the increase in the growth rate of Punjab, which is considered to be one of the most developed states and has done fairly well in family planning programme is also perplexing and intriguing to planners, programme administrators and academicians. The State of Himachal Pradesh, which is considered to be relatively more backward (economically) than Punjab and has performed less successfully in family planning than Punjab, has experienced a substantial decline in its growth rate, while the rate of growth in Punjab has continued its ascent. These are some of the perplexing questions baffling the demographers and development planners, and in order to answer them satisfactorily, more detailed information on the population composition, particularly the age distribution, is needed.

Figure 1 provides a pictorial representation of the trends in the growth rates of the population for the country as a whole and separately for Group A, B and C states. The population covered in these three groups of states constitute 43.2, 23.8 and 33.0 percentage respectively of the population of the total of the seventeen states.

The decline in the growth rate of a developing country, where there are intensive public health programmes, aimed at the control of epidemic and communicable diseases and improvement of the nutritional status of the population, is possible only when there is a decline in fertility, which can more than compensate the decline in mortality. Hence, there is no doubt that the populations in most of the states in India, particularly Group B and Group C states constituting about 57 per cent of the population of the country, are currently undergoing a rapid decline in the fertility levels, more pronounced in some states than in others. A good share of the credit for this decline should be given to official programmes of family planning.

[a] The 1981 Census in the State of Jammu and Kashmir was conducted from 20 April to 10 May 1981 and refer to 1 May 1981. The Census operation in the State of Assam is yet to be conducted. In all other States and Union Territories of India, the 1981 Census denotes the count as on 1 March 1981.

III. Migration Rates

(a) *International Migration*

The population change in any state during a period is the net effect of births, deaths, international migration and internal migration. In order to study the extent of natural increase, it is necessary to adjust for the effects of international and interstate migration. The tabulations of 1951, 1961 and 1971 censuses include tables on persons enumerated in each district classified by place of birth; number born in the same district (same as enumeration); another district within the same state; another state within India; and outside India. These tabulations with further details on duration of residence at the place of enumeration form the bases for analyses and inferences on migration, interstate as well as internationai.

With regard to international migration, such analyses based on 10 per cent sample of individual slips in rural areas and of 20 per cent in urban areas for the 1971 Census, and complete analysis of 1961 Census, revealed that in 1961 Census the number of foreign born enumerated was 9,064,222, as against the estimated figure of 9,098,395 persons in 1971 Census.[12] Assuming an overall ten year survival rate of 0.87 for the foreign born, it can be estimated from these two figures that 1.2 million foreign born persons came to India in the decade 1961-71. As far as the total volume of immigrants into the country in this decade, this is perhaps an underestimate.

When we examine the volume of inmigrants and outmigrants from each state in 1971, by place of last residence concept, the totals add up to 26,995,872 and 12,452,228 respectively. The difference between the two figures is 14,543,644 persons. In the absence of any immigrants from outside the country during the decade, the totals of immigrants and outmigrants for all the states should be the same. Again, from 1971 Census, the percentage distribution of inmigrants by duration of residence shows that 42.1 per cent of the migrants had less than 10 years duration of residence in the piace of enumeration.[13] This indicates that about 6.1 million inmigrants entered the country during 1961-71. Thus we see from the place of birth data that the net inmigration of foreign born persons into India during 1961-71 was about 1.2 mililon, and from the "place of last residence" data, considered along with 'duration of residence' the net inmigration from outside the country was 6.1 million persons. It can, therefore, be surmised that in 1961-71, the net entrants into India from outside was about 6.1 million persons, of which, 1.2 million were foreign born and the remaining were possibly Indian nationals returning to the country. This is only a conjecture and it can be concluded that the net international inmigration into India ranged between 1.2 to 6.1 million during this decade. For the decade 1971-81, the analysis by Mukerji shows that in this decade, the net immigration into India could even be of the order of 11.5 million persons.[14] This is based on an adjustment of birth and death rates of SRS furnished by the Registrar General. If we assume that the SRS birth rate of 34.4 and death rate of 15.0 for the year 1976 are approximately correct and even if in error, have the same magnitude, the annual natural rate of increase in population for the decade is 19.4 per thousand per year. The observed rate of increase as indicated earlier from the census results is 21.7 and the difference between these two rates or 2.3 per 1000 can be taken to represent an approximated upper bound of international migration during the decade. With this rate of annual immigration, the net immigrants into the country is estimated at 14.08 millions during the decade. Thus the range of volume of immigrants from outside into the country can be anything from 11.5 to 14.1 millions during the decade. The analysis reveals that the number of persons immigrating into India has been increasing since 1951, but the percentage contribution of such international immigrants into the country to the decadal increase in population is not likely to be significant; hardly exceeding ten per cent of the increase in population during the decade 1971-81. It is possible that a proportion of these immigrants are of Indian origin who have emigrated prior to 1971 and returned to India after 1971. This needs further analysis and research.

(b) *Interstate Migration*

The intercensal growth rates of the population of the different states in India are influenced by the natural increase (balance of births and deaths) and the interstate migration. Estimation of interstate migration has been one of the ticklish problems and a number of methodological innovations has been made in the past. Broadly, the methods can be divided into two categories: the first based on the information on the place of birth of every person enumerated in a census and the second, based on the place of last residence and duration of residence in the place of enumeration of each individual.[2] Till the 1961 Census, only information on place of birth and duration of stay at the place of enumeration was collected. It is since the 1971 Census that information on 'place of last residence' has been recorded. The 1981 Census data are yet to be analysed in this regard. Recently, Mukherji has developed a method for estimating all the vital rates including interstate migration rates based on an analysis of intercensal growth rates and a preliminary set of birth and death rates for each state. The estimates appear to be divergent from the past trend. Table 2 provides estimates of interstate migration rates, expressed as number of net inmigrants into a state (difference between inmigrants and outmigrants) per 1000 population per year as obtained from two sources for each of the decades 1951-61, 1961-71 and 1971-81.

For the decade 1951-61, the first estimate provided in column (2) is the official estimate given by the Census Actuary[5] and is based on place of birth statistics. Since there was a reorganisation of the states

in India in 1956, based on the recommendations of the States Reorganisation Commission, the delimitation of interstate migration varied and the revised estimates taking the boundary changes into account were worked out by Zachariah and Seetharam[15] and are given in column (3). Comparisons of the figures in these two columns reveal that the two rates generally agree in broad orders of magnitude, and as can be expected, the rates are relatively small for most of the states. The states exceeding a net inmig ation rate of 1 per 1000 population per year (or one per cent during the decade) are: Assam (6.7), West Bengal (6.4), Madhya Pradesh (2.4), Orissa (1.4), and Gujarat (1.1) among the net inmigrating states, and Kerala (—1.9), Punjab (—1.3), Uttar Pradesh (—1.3) and Tamil Nadu (—1.1) among the net outmigrating states. Excepting Assam and West Bengal, which were having rather high rates of inmigration, over 6 per 1000 per year, the other states had relatively low inmigration rates.

For the next decade 1961-71, again two sets of estimates are given in Table 2. Column (4) provides the official estimates based on place of birth statistics analysed from one per cent sample of 1971 individual slips and column (5), the estimate used by the Expert Committee on Population Projections, in 1978. Again, these two estimates are different only marginally. The states having more than a net inmigration rate of one per 1000 per year are: Orissa (1.31) and Maharashtra (1.14) among net inmigrating states, and Kerala (—1.53) and Uttar Pradesh (—1.05) among net outmigrating states. While Kerala and U.P. continued to retain their status as net outmigrating states in 1961-71 as in 1951-61, and Maharashtra and Orissa as net inmigrating states in these two decades, West Bengal had reversed its status from a net inmigrating state to net outmigrating state between the two decades. However, the rate of interstate migration seems to have generally declined during 1961-71 compared to 1951-61 in most of the states.

For the decade 1971-81 no estimates of interstate migration, based on 'place of birth' statistics or on 'place of last residence' and 'duration of residence' statistics are available, as yet, since the analysis of 1981 Census figures, in this aspect, is yet to be carried out. However, two estimates recently made at the International Institute for Population Studies, Bombay, are given in columns (6) and (7) of Table 2. Column (6) provides the estimate obtained by Mukerji[1] using growth rate and corrected data on birth and death rates for each state, obtained from Sample Registration Scheme, and Column (7) provides direct estimates based on differencing the intercensal growth rate (annual exponential value) and the estimate of natural increase rate as obtained from the birth and death rates from the SRS for 1976. The basic difference between Mukerji's method and the direct method is that Mukerji attempts at a correction of SRS vital rates for the decade 1971-81, assuming that they are underestimates. In the direct method, it is assumed that the 1976 estimates of birth and death rates, obtained from SRS, are such that the difference between the two will be a good estimate of the rate of natural increase of population in the state for the decade 1971-81 though, each rate may have the same bias. The estimates of migration rates given in columns (6) and (7) reveal that there are substantial differences between the two sets of estimates and Mukerji's estimates are generally lower in magnitude. However, both the sets reveal an increased volumne of interstate migration, particularly inmigration during 1971-81 compared to earlier decades. According to Mukerji heavy migration is estimated in Assam (9.08), Rajasthan (3.99), Karnataka (3.97), Jammu & Kashmir (3.06) and West Bengal (1.81) as inmigrating states, and Kerala continues as the only significant outmigrating state (—1.92). The upper limit of the component of immigration from other countries into India during 1971-81, is estimated to be 11.5 million compared to 6.1 during the decade 1961-71 and 3.3 million during 1951-61. However, these estimates are to be considered tentative and since based on a methodology different from the earlier censuses, they are not strictly comparable with the estimates for 1951-61 and 1961-71.

As a summary of the findings from migration analysis, it can be stated that in India except for big cities and a few states as Assam, Maharashtra, Rajasthan and Kerala, migration seems to have negligible effect on the growth and distribution of population. The place of birth statistics from 1961 and 1971 Censuses reveal that 67 and 70 per cent of the enumerated population in these two censuses have reported their place of births, the same district as the place of enumeration. The volume of migration seems to have substantially increased during the decade 1971-81 compared to the previous two decades and there is evidence of increased immigration into the country.

IV. Trends in Birth and Death Rates

(a) *Estimates Based on Censuses and Sample Registration Scheme*

The system of registration of births and deaths in India continues to remain grossly-deficient in spite of the increasing emphasis placed over the years on public health and family planning programmes and inherent dire need to improve the vital registration system to serve as a basis for the monitoring and evaluation of these programmes. More than 40 per cent of the deaths and births remain unregistered and even those that are registered are known to have serious errors in the recorded characteristics. As a result, any realistic assessment of the levels and trends in vital rates in India has to be based on indirect methods with all their limitations. Two types of such methods are currently available. The first includes methods based essentially on Census data particularly the size, age, and sex distribution of a population at successive Censuses—in principle, those methods contained in the U.N. Manual IV. The

second type is based on the Sample Registration System (SRS) developed and implemented by the Registrar General of India, which is a dual record system wherein a scheme of intensified registration of vital events in sample areas is followed by an independent half yearly survey of the households, together providing estimates of vital rates, considered to be fairly reliable from 1970. In this chapter, estimates based on Census data for study of trends upto 1971, on SRS data thereafter and also those based on a projection model have been used.

Table 3 presents in columns 2, 3 and 4 official national level estimates of the crude birth rate, death rate and infant mortality rate for the intercensal periods 1951-61 and 1961-71 computed by the Actuary on the basis of the three Censuses and the estimates for subsequent years from 1970 to 1978 obtained from the Sample Registration System. It is interesting to note that the pace of decline in mortality levels in India has slowed down during the period 1970-78. The infant mortality rate, in particular, appears to be stagnant at a fairly high level, around 130, since 1966 and this is perplexing in view of the fact that inputs into the maternal and child health activities, as a part of the family welfare programme, have been more than doubled during 1970 to 78. Reductions in mortality during the past fifteen years in most areas of the country seem to have occurred to a relatively greater extent among adults than among infants and children and the infant mortality rate appears to be unusually high when compared to contemporary experience in developing countries.

These disproportionate changes in mortality levels have two side effects: (1) By increasing the life span of adults, the proportion of currently married women in the reproductive ages would continue to increase unless there is a sharp increase in age at marriage. Thus, even when the age-specific marital fertility rates remain the same, this will have a tendency to push up the crude birth rate; and (2) The prevalence of relatively high levels of infant and child mortality would discourage acceptance of family planning methods especially limitation methods, among couples with two or three children, among the poorer socio-economic strata who are subject to higher mortality rates.

Table 3 also reveals that birth rates in India have never been very high and historically they have been kept well below the biological maximum because of a number of socio-cultural and possibly, health factors. The official estimate of the birth rate during the decade 1951-61, around 1956, was 41.7, though this figure is disputed by a number of demographers and a rate of 44 is considered as a more reasonable estimate for this period. But the fact remains that factors such as prohibition of widow remarriage, taboos on sexual intercourse on a number of days in the year for religious and social reasons, long periods of breast feeding, and to some extent, increased incidence of secondary sterility caused by febrile diseases such as malaria, tuberculosis and malnutrition have kept the potential fertility levels of the average Indian couple, at a fairly low level as compared to couples in other developing countries. With rapid modernization, since 1951, these checks are being removed and potential fertility rates can be expected to be on a rising trend. Under these circumstances, it is in a way heartening to note that during the period 1966 to 1978, there was an 8-point decline in the crude birth rate from 41 to 33. This decline is by no means a small achievement, and a good share of the credit should be assigned to the family planning programme.

The phenomenon of decline in fertility during 1966 to 1978 is observed from data from two independent sources: the Expert Committee's projections' which are based on adjusting the intercensal birth rate for 1961-71 for family planning acceptance and percentage of couples effectively protected from 1966, and the SRS estimates for 1972, 1976 and 1978 which are based on independent field data. The estimated birth rate around 1978 by the first method is 32.9 and by the second method, is 33.3. The death rate estimates are 13.2 and 14.2 respectively. Of course, the possibility of both the systems underestimating the vital rates cannot be ruled out. Statewise data on estimates of crude birth and death rates from 1951 to 1981 from the two independent sources are given in Table 4. The good consistency of the estimates for most of the States except Andhra Pradesh, Assam, Gujarat, Madhya Pradesh, Uttar Pradesh and West Bengal (Where the difference is more than 3 points in the crude birth rate), cannot be considered as a sheer coincidence. While the Expert Committee has underestimated the vital rates for 1978 for the States of Andhra Pradesh, Gujarat, Madhya Pradesh and Uttar Pradesh, it has overestimated them (in comparison with SRS estimates) for Assam and West Bengal. For the country as a whole, a reduction in the birth rate of eight points in 12 years (1966-1978) is indicated by both sets of data. Only four to five point reduction in the crude death rate has been indicated during this period. In order to test the validity of the estimates provided by the Censuses and the Sample Registration System, the results obtained from an expanded component projection model are provided in the next section.

(b) *Estimates of Vital Rates derived from an Expanded Component Projection Model*

This component projection model starts with the smoothened age-sex-marital status distribution of the population as per the 1961 Census, and uses a potential age-specific marital fertility schedule consistent with the 1951 and 1961 Censuses. From 1961 onwards the potential fertility rates are adjusted each year for family planning use. The increment in the expectation of life each year from 1966, is also adjusted so that the population count of the 1981 Census is reached, separately, for males and females. The projection is done separately for each State and the natural population of each State (taking account of net migration) is estimated as of 1 October 1981 assuming that the net migration rate for each State

assumed by the Expert Committee for the decades 1961-71 and 1971-81, and given in Table 2, will be true. The projection model has the following specific characteristics for each State :

(1) It is consistent with the smoothened age-sex-marital status distribution of the population as of the 1961 Census.

(2) The potential age-specific marital fertility rates are adjusted each year, taking into account the number of acceptors of various family planning methods, from within the programme. In other words, the family planning acceptor data since the inception of the programme in each State, are taken into account in the projection model for modifying fertility trends.

(3) Changes in the proportion married occurring for each year of age from 15 onwards, during 1961 to 1971 (as obtained from Census results), are continued thereafter.

(4) The increment in the male and female expectation of life for each State since 1961 is such that the sex ratio of the population in 1981 as obtained from the Census, will be realised.

(5) The rates of interstate migration assumed by the Expert Committee are adopted.

(6) The 1981 Census count of population totals for males and females for each State are achieved.

In other words, the projection model makes use of most of the available information in terms of population size and age-sex marital structure from the 1961 Census, population totals by sex from the 1981 Census, family planning statistics and potential marital fertility levels. The projection model is an adaptation of an earlier model developed by Srinivasan, Roy and Ghogale[12], for the estimation of family planning targets needed by major States in India in order to reach the goal of a Net Reproduction Rate of one by 1996 on the average and by 2001 for all States, a policy adopted in the Sixth Five Year Plan (1980-85) document.

The results from the model are presented in Table 5, and summaries in terms of resultant CBR, CDR and IMR in different years are provided in columns (5), (6) and (7) of Table 3 for ready comparison with official estimates. It can be seen from these two tables that the estimates of crude birth rate based on the projection model for 1976 to 1981 are slightly higher than the official estimates by about two points. The estimated CBR and CDR for 1981 by the model, is 34.7 and 13.1 respectively. The percentage couples effectively protected by 1 October 1980 is 23.4, slightly higher than the official estimate of 22.6 per cent owing to an assumed difference in the age distribution of acceptors in the model.

Table 5 presents a comparative demographic profile based on the model, of the population of the country with and without a family planning programme, the latter being the hypothetical situation wherein the number of programme acceptors of all family planning methods is made 'zero'. From Table 5, other detailed outputs available from the model but not included here and simple demographic analyses, the following conclusions are drawn :

(1) The results obtained from the model, on the projected population size for 1971, indicate that there is a sizeable under-enumeration of the 1971 Census population relative to the 1961 and 1981 Censuses. The relative underenumeration in 1971 is of the order of 1.1 per cent and the Census results have underestimated the decadal growth rate during 1961-71 and overestimated it during 1971-81.

(2) The observed sex ratio of the 1981 population can be realised only if the increment in the female expectation of life during the decade 1971-81 is higher than that of males. The model estimates that the annual increase in female during 1966 to 1981 was 0.62 and for males 0.43. The expectation of life for females in 1981 is 54.0 years as compared to 52.9 years for males. The female expectation of life surpassed the male level in 1976. The impact of various welfare programmes for women, especially the maternal and child health programmes, seem to have had a substantial impact on the longevity of women.

(3) The crude death rate estimated from the model for 1976 i.e. 14.6 agrees quite closely with the level of 15.0 estimated from the SRS. This estimate assumes that there is no sizeable international migration during the decade. In case there is a sizeable immigration into the country, the death rate would be higher than 14.7 in 1976. The SRS estimates on the death rate appear to be quite consistent with the estimates from the model for recent years, the two being based on completely different methodologies.

(4) The potential marital fertility rate during the period 1961-81 was about 3 per cent higher on an average, than the potential fertility rate during the earlier decade 1951-61. This rise in the potential fertility of the population could have been caused by the fertility increasing effects of the early stages of modernization. However, the decrease in the proportion married in the age groups 15-19 and 20-24 due to an increase in age at marriage was more than that required to compensate for the fertility increasing effects of modernisation and also the marginal rise in the proportions married among older women (above 30) caused by a rise in the adult expectation of life. Thus, the likely increase in fertility that could have occurred due to an increase in potential fertility and demographic structural change is more than neutralised by the rising age at marriage.

(5) The reduction in the crude births rate from 1966 to 1981 due to changes in age at marriage is estimated to be 3.2 points and due to family planning, 6.2 points. However, the net reduction in the birth rate is 8 points and the difference is due to inter action. The quantum of reduction due to these two

factors varies considerably among States. The current (1981) birth rate is estimated as 34.7 per thousand population.

(6) The population of the country on 1 October 1981, would have been 736 million, if there had been no family planning programme. The current estimate (1 Oct '81) based on the 1981 Census is 694 million and thus the family planning programme has helped to lower the population figure by 42 million, which is no small achievement. The births averted since the inception of the programme are more than this figure (accounting for mortality) and these estimates are higher than the official estimates which tend to be conservative. The family planning programme has been quite effective in toning down the growth rate and there appears to be no justification for being frustrated on the family planning front.

(7) It is to be realized, however, that the population of the country has literally doubled itself during the past 34 years since independence and a 'Second India' has been added within the same territory.

(8) With the current birth rate estimated at 34.7 and death rate at 13.1 per thousand, the population is growing at 2.16 per cent per annum. The estimated growth rate based on a simple analysis of the trends in the growth rates given in Section 2 is also found to be 2.17 and is quite close to the estimate which is based on an independent methodology. If this growth rate continues the population of India will double itself in 32 years, to the mind-boggling figure of 1400 million by 2013 crossing the billion mark by the turn of the century. Even if the rate of growth is going to be more than halved to one per cent immediately, the net addition to the population each year from henceforth will be more than what was added annually since the 1950s.

V. Quality of Data

The data collected in the Censuses in India are subject to varying types and degrees of errors and biases. Three major types of such errors and response biases have been identified: (i) Errors of population coverage, particularly omission of the population in the census-count, (ii) errors and biases in the reporting of characteristics, particularly digit preferences in the reporting of age, and (iii) errors associated in the compilation and analysis of data attributable to sampling and non-sampling factors.

An assessment of the magnitude of these three types of errors and biases, and corrections needed, are made usually on the basis of a post-enumeration check carried out on a sample of the population by more experienced investigators, independently and immediately, after the main census count is taken. The preliminary results of the post-enumeration survey conducted after the 1981 Census have been made available recently.

Table 6 : Net Omission in Census Count by Sex and Rural-Urban Areas, 1951-81

Census Year	Net Omission (per 1000 population)				
	Total	Male	Female	Rural	Urban
1951	10.9	9.6	12.2	10	14
1961	6.8	N.A.	N.A.	6	10
1971	16.7	15.3	18.3	14	27
1981	18.0	17.1	18.9	15	28

Table 6 presents the extent of net omission in the census count in the Censuses of 1951, 1961, 1971 and 1981 classified by male and female, and rural-urban areas. From this table it can be seen that the extent of omission in the Censuses, per 1000 population, was 11 in 1951, 7 in 1961, 17 in 1971 and 18 in 1981. The percentage omission is found to be more among the females than males in all the censuses and surprisingly more among the urban than in the rural population. In 1971 and 1981 Censuses, the net omission in the urban areas was 27 and 28 per 1000 population compared to 14 and 15 per 1000 population in rural areas. Thus it appears that the 1981 Census had omitted to count a slightly higher percentage of population than the earlier census as given by the Post Enumeration Survey. However, since both the quality of the census count and the quality of Post Enumeration Survey are involved in determining the net omission rate, it is difficult to judge the quality of census data only from Post Enumeration Survey data alone. If adjustments for omission are made in the Census populations and the growth rates recomputed, it is found that the intercensal growth rate for 1961-71 is raised more than in the 1971-81 period and there is a greater quantum of decline in the growth rate between the two decades than what has been observed from the enumerated results. Various scholars have opined from time to time that the real magnitude of omission of population in the census counts in India is likely to be much higher than those detected in the post-enumeration check (17 and 18 per 1000 population for 1971 and 1981), since even in developed countries, with their good system of identification of households and people, an undercount comes to the extent of two per cent or more[1]. On the other hand, it is also possible that since the majority of the Indian population in rural areas is immobile, the chances of their being identified and included in the Census count are much higher than in a mobile population in the more developed societies. This is partly substantiated from the fact that the omission rates estimated in the urban populations in India are almost twice as high as in the rural areas.

The errors and biases in the reporting of the characteristics in the Census returns in the Indian Censuses have been studied by demographers using various techniques. Particularly, the biases in the reporting of the age of the population have been studied using a number of indices such as Myer's Index, Whipple's Index and the U. N. Joint Score. Among these indices, the age-ratio score, sex-ratio score and the joint-scores developed by the U.N., are indicative of the

extent to which there are mis-reportings, of ages, separately by the two sexes. This methodology requires estimation of age ratio and sex ratio scores. Age ratio is defined as the ratio of population enumerated in a quinquennial age group per 100 average population enumerated in the adjacent age groups. Ordinarily, for correct age reporting, this ratio should be close to 100. Disturbances in the population trend due to war casualities, temporary birth deficits or sex selective migration affects this ratio. Age ratio score is then calculated as the mean of the sum of the deviations of the age ratios from 100, irrespective of signs. Sex ratio score is calculated from successive difference of the sex ratios of the age groups. It is the average of the successive differences irrespective of signs. Finally, the joint score is calculated as the sum of three times the sex ratio score, the age ratio score of male, and age ratio score of female. There is no upper limit for joint score. The value will be zero only when the distribution of the male and female population is rectangular, that is, same number of males and same number of females are enumerated in each age group. It will be close to zero if the distribution by age is linear, that is, the decrease in the number of males/females from one age group and the next higher age group is constant. For countries where age reporting is accurate, the point-score has been found to be very low. Therefore, it has been suggested to compare the estimated point-score with that of the country known to have correct age reporti"g.

Table 7 provides data on these indices for the 1951, 1961 and 1971 Censuses, and for comparison purposes on the Censuses, of Sweden for 1935, 1940 and 1945. These ratios have been calculated for both the single year and quinquennial age data. The index calculated for the single year data will give an idea about the extent of neutralisation of the mis-statement of ages when the age data are grouped in quinquennial ages. From this table it can be seen that the quality of age data reported in the 1971 Census in India is far poorer than the quality of data reported in 1935 Census in Sweden. More disappointing is the findings from Table 7 that the age ratio scores do not seem to decrease with time but, on the other hand, seem to increase on the basis of data compiled from individual age returns, both for males and females. In this connection, it has to be pointed out that the smoothening of age distributions adopted for the Census data eliminates considerably the response errors in age reporting but also introduces unknown magnitudes of biases caused by the smoothening procedures. For example, a comparison of the enumerated and adjusted population in the age group 0-4 is an indication both of the extent of omission of the children in the censuses, which is a well known fact, and also the effect of procedures adopted for smoothening the age distribution.

Table 8 provides the percentage of children 0-4 in the enumerated and adjusted population in 1951, 1961 and 1971 Censuses. This table reveals that the extent of undernumeration of children in the 1971 Census is higher than in 1951 and 1961 Censuses, both for males and females. Part of this error can be attributed to actual enumeration of children and part due to the smoothening of procedures adopted. On the whole, it appears that the quality of age data compiled in the Censuses, has not improved since 1951.

Reference

1. Dyson, T., "Preliminary Demography of 1981 Census", *Economic and Political Weekly*, Bombay, 15 August 1981.
2. Mehrotra, G. K., Birth Place Migration in India, Census of India, 1971, Special Monograph Number 1, 1974, Office of the Registrar General, Ministry of Home Affairs, Government of India.
3. Ministry of Health and Family Welfare, "Family Welfare Programme in India—Year Book 1979-80", Government of India, New Delhi, March 1981.
4. Mukerji, S., "Natural Increase and Migration as Components of Population Growth: Indian Union and Major States", The Journal of Family Welfare, Vol. XXVIII, No. 2, 1981.
5. Registrar General and Census Commissioner, "Census of India, 1961, Vol. I, Social and Cultural Tables, Part II-C(ii)", Government of India, New Delhi, 1964.
6. Registrar General and Census Commissioner, "Census of India, 1971—Series I, Social and Cultural Tables, Part II-C(ii)", Government of India, New Delhi, 1976.
7. Registrar General of India, "Report of the Expert Committee on Population Projections, Paper No. 1 of 1979", Government of India, New Delhi, 1979.
8. Registrar General and Census Commissioner, "Provisional Population Totals, Census of India 1981, Series 1, Paper 1, Government of India, New Delhi, 1981.
9. Census of India, 1981, "A Note on the Post Enumeration Check, New Delhi" August 1982.
10. Rele, J.R. and Sinha, U.P., "Birth and Death Rates in India during 1961-70—A Census Analysis", Demography India II, No. 2, 1973.
11. Sinha, U. P. and Rao, Yogini, "Estimates of Levels and Trends of Birth Rates as assessed from the Sample Registration System, 1971-81", The Journal of Family Welfare, Vol. XXVIII, No. 2, 1981.
12. Srinivasan, K., Roy, T. K. and Ghogale, S., "Family Planning Targets by States for India" under "Alternative Programme Strategies to Reach the Demographic Goal of NRR-1 during the Decade 1991-2001", International Institute for Population Studies, Bombay, December 1980.

13. Srinivasan, K., "A Reappraisal of the Recent Trends in Growth and Vital Rates of Population in India based on the 1981 Census Count", The Journal of Family Welfare, Vol. XXVIII, No. 2, 1981.

14. Srivastava, S. C., Migration in India, Census of India 1971, Paper No. 2, of 1979, Office of the Registrar General of India, New Delhi.

15. Visaria, P., and Visaria, L., "Indian Population Scene After 1981 Census—A Perspective", Economic and Political Weekly, Vol. XVI, Nos. 44, 45, 46, November 1981, pp. 1727-1780.

16. Zachariah, K. C., and Seetharam, K. S.,"Inter-State Migration in India, 1951-61",, Indian Journal of Public Health, Vol. XII, No. 1, 1968.

Table 1 : Trends in Population Growth Rates by Major States/Areas in India, 1951-81

States/Area	Annual Rates of Exponential Growth(r) Estimated from Census			Estimated[1] Growth Rate in 1981	Census Population of 1981 ('000)
	1951-61	1961-71	1971-81		
1	2	3	4	5	6
1. Andhra Pradesh	1.45	1.88	2.07	2.00	53,404
2. Assam	3.00	2.97	3.11	3.24	19,903[5]
3. Bihar	1.80	1.92	2.16	2.33	69,823
4. Gujarat	2.38	2.56	2.43	2.25	33,961
5. Haryana	2.91	2.77	2.49	2.30	12,851
6. Himachal Pradesh	1.64	2.06	2.04	1.87	4,239
7. Jammu & Kashmir	0.90	2.57	2.52	1.85	5,954[6]
8. Mysore (Karnataka)	1.95	2.15	2.37	2.49	37,043
9. Kerala	2.21	2.31	1.75	1.22	25,403
10. Madhya Pradesh	2.16	2.50	2.26	1.92	52,133
11. Maharashtra	2.12	2.41	2.20	1.91	62,694
12. Orissa	1.81	2.22	1.82	1.32	26,272
13. Punjab	1.95	1.95	2.09	2.21	16,670
14. Rajasthan	2.33	2.44	2.83	3.13	34,103
15. Tamil Nadu	1.12	2.00	1.60	0.92	48,297
16. Uttar Pradesh	1.54	1.79	2.29	2.63	110,858
17. West Bengal	2.84	2.36	2.08	2.02	54,486
Group A States [2]	1.85	2.02	2.37	2.61	288,400
Group B States [3]	2.21	2.26	2.18	2.09	158,939
Group C States [4]	1.83	2.30	1.99	1.54	220,752
INDIA	1.96	2.20	2.23	2.17	683,782

[1] The rate of growth for 1981 is estimated by fitting a second degree curve through the values for 1956, 1966 and 1976.
[2] Group A States includes Assam, Bihar, Karnataka, Punjab, Rajasthan and Uttar Pradesh.
[3] Group B States includes Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh and West Bengal.
[4] Group C States includes J & K, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu.
[5] Estimated Population.
[6] Enumerated Populations as on 1 May 1981.

Table 2 : Estimates of Net Migration Rates : 1951-61, 1961-71 and 1971-81

(Per thousand population per year)

State/Area	1951-61		1961-71		1971-81	
	Census Actuary [1]	Zachariah Seetharam [2]	Official[3]	Expert Committee[4]	Mukerjiee[5]	Direct difference of observed growth on SRS rates[6]
1	2	3	4	5	6	7
1. Andhra Pradesh	0.06	0.22	—0.17	—0.25	0.87	1.50
2. Assam	7.95	6.66	0.35	0.73	9.08	13.20*
3. Bihar	0.84	0.08	0.17	—0.11	3.02	2.60
4. Gujarat	1.76	1.14	0.57	0.52	0.66	2.20
5. Haryana	..	..	..	..	..	1.40
6. Himachal Pradesh	..	..	..	..	..	1.40
7. Jammu & Kashmir	N.A.	N.A.	1.05	N.A.	3.06	5.30
8. Mysore (Karnataka)	0.17	0.23	—0.63	—0.51	3.97	6.0
9. Kerala	—0.79	—1.87	—1.29	—1.53	—1.92	—2.2
10. Madhya Pradesh	1.80	2.38	0.41	—0.27	0.31	—0.7
11. Maharashtra	—0.26	0.74	0.95	1.14	2.87	4.0
12. Orissa	0.67	1.39	1.39	1.31	0.53	—0.8
13. Punjab	—3.17	—1.32	..	N.A.	—0.65	0.3
14. Rajasthan	—0.05	0.12	—0.20	—0.43	3.99	9.6
15. Tamil Nadu	—1.29	—1.14	0.63	N.A.	—0.41	—0.1
16. Uttar Pradesh	—1.27	—1.29	—0.78	—1.05	0.86	3.4
17. West Bengal	6.61	6.37	—1.25	—0.74	1.81	0.8

Note : Upto the decade 1961-71 Assam includes Meghalaya and Punjab refers to Punjab and Haryana.

*For Assam since no census was conducted, the net immigration rate represents the difference in the growth rate assumed by the expert Committee (1978) and the growth rate implied by the SRS for 1976.

[1] Vital Statistics of India, 1961, Office of the Registrar General, India, New Delhi, 1964.

[2] Computed from K.C. Zachariah and K. S. Seetharam, "Inter-state Migration in India, 1951-61", *Indian Journal of Public Health*, Vol. XII, No. 1, 1968, pp. 47-63.

[3] Computed from G.K. Mehrotra, *Birth Place Migration in India*, Census of India, 1971, Series I India, Special Monograph No. 1 1974, p. 106.

[4] Computed from Report of Expert Committee on Population Projections, Census of India, 1971, Series I India, Paper 1 of 1979 p. 25.

[5] See S. Mukerjee, "Natural Increase and Migration as Components of Population Growth: Indian Union and Major States", The Journal of Family Welfare Special Census Number, Vol. XXVIII, No. 2, 1981, pp. 34-43.

[6] Estimated from the natural growth rate of SRS (difference of birth and death rates) for the year 1976 and the annual rate of growth of enumerated population.

Table 3 : Fertility and Mortality Trends in India

(Official and Estimated)

Year	Official			Based on Projection Model*		
	CBR	CDR	IMR	CBR	CDR	IMR
1	2	3	4	5	6	7
1956 (1951-61)	41.7	22.8	146	..	..	..
1966 (1961-71)	41.2	19.0	129	42.9	19.0	136
1970	36.8	15.7	129	39.5	17.0	153
1971	36.9	14.9	129	39.1	16.6	133
1972	36.6	16.9	139	38.2	16.2	132
1975	35.2	15.9	140	37.1	15.0	131
1976	34.4	15.0	129	36.2	14.7	130
1977	33.0	14.7	129	33.2	14.1	130
1978	33.3	14.2	125	34.0	13.8	129

Notes: 1. Estimates for 1956 and 1966 are the averages for the intercensal periods 1951-61 and 1961-71 and based on actuarial analysis.

2. Estimates for other years based on SRS data.

3. SRS data for 1973 and 1974 not given since considered not reliable.

*By Srinivasan, Roy and Ghogale.

Table 4 : Estimates of Crude Birth and Death Rates for Different Periods obtained from Census Data and Comparable figures from Sample Registration Scheme

Area	Estimated from Census				Expert Committee Assumption				Estimate of Sample Registration						Difference between Expert Committee & SRS in 1978
	1951-61		1961-71		1971-76		1976-81		C 1972		C 1976		C 1978		
	CBR	CDR	CBR	CDR	CBR	CDR	CBR	CDR	CBR	CDR	CBR	CDR	CBR	CDR	CBR
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Andhra Pradesh	39.7	25.2	39.2	20.4	33.1	15.5	28.9	12.8	35.8	16.1	33.7	14.5	33.6	13.3	—4.7
2. Assam	49.3	26.9	48.4	19.0	42.6	10.4	38.9	8.6	35.4	17.9	32.8	14.9	30.8	13.2	—8.1
3. Bihar	43.4	26.1	41.9	23.3	38.6	18.6	34.2	15.5	33.1	18.3	31.1	12.1	N.A.	N.A.	N.A.
4. Gujarat	45.7	23.5	41.6	16.8	34.4	12.2	31.4	10.4	40.2	14.9	37.4	15.3	35.8	12.7	—4.4
5. Haryana	N.A.	N.A.	44.5	16.8	35.0	13.1	33.0	10.8	40.5	11.7	36.3	12.8	33.5	13.5	—0.5
6. Himachal Pradesh	N.A.	N.A.	37.6	17.1	N.A.	N.A.	N.A.	N.A.	33.1	15.9	32.5	13.5	26.3	11.8	N.A.
7. Jammu & Kashmir	N.A.	N.A.	41.5	17.0	N.A.	N.A.	N.A.	N.A.	31.6	10.8	32.1	11.3	31.8	11.7	N.A.
8. Mysore (Karnataka)	41.6	22.2	39.9	17.6	35.2	14.9	31.4	12.4	31.5	12.8	29.4	11.7	29.2	12.0	—2.2
9. Kerala	38.9	16.1	37.5	13.7	30.8	9.2	26.6	8.5	31.2	9.2	27.8	8.1	25.2	7.0	+1.4
10. Madhya Pradesh	43.2	23.2	46.6	21.5	42.1	15.0	33.9	12.2	39.3	18.7	39.8	16.5	37.2	15.1	—3.3
11. Maharashtra	41.2	19.8	41.0	16.9	31.5	11.3	27.2	9.5	32.2	12.8	29.3	11.3	26.9	10.3	+0.3
12. Orissa	40.4	22.9	41.3	20.5	35.6	13.7	31.9	11.6	34.5	20.0	34.8	15.8	32.9	14.1	—1.0
13. Punjab	44.7	18.9	36.9	17.4	29.7	12.8	28.2	10.9	34.6	12.6	31.6	11.0	29.4	11.6	—1.2
14. Rajasthan	42.7	19.4	42.7	18.7	39.3	11.9	35.3	10.1	42.4	16.8	33.4	14.7	35.5	15.6	—0.2
15. Tamil Nadu	34.9	22.5	36.8	16.8	30.0	15.3	26.1	12.8	32.4	15.1	30.7	14.6	28.8	12.8	—2.7
16. Uttar Pradesh	41.5	24.9	42.5	24.2	38.8	20.6	35.1	17.2	43.2	25.6	40.0	20.5	40.4	20.2	—5.2
17. West Bengal	42.9	20.5	44.3	18.5	39.5	14.2	33.3	11.7	N.A.	N.A.	31.9	11.9	28.4	11.6	+4.9
INDIA	41.7	22.8	41.2	19.0	36.6	15.2	32.9	13.2	36.6	16.9	34.4	15.0	33.3	14.2	—0.4

N.A. Not Available

Source : Census Publications, Report of Expert Committee on Population Projections (1979), and Sample Registration Bulletin.

Table 5 : Estimates of Population Size and Vital Rates on the Basis of A Model With and Without Family Planning

	Demographic Parameters Estimated by a Model Projecting 1961 Census to 1981 Census (with Family Planning) (on 1 October of years)				Demographic Parameters Projected from 1961 through the Model in the absence of Family Planning (without Family Planning) (on 1 October of years)			
	1961	1971	1976	1981	1966	1971	1976	1981
1	2	3	4	5	6	7	8	9
Population Size ('000)	501,050	561,790	626,144	693,047	501,613	568,075	645 468	735,506
CBR	42.95	39.05	36.17	34.69	44.07	42.82	41.58	40.90
GFR	207	189	173	159	213	210	205	199
CDR	19.03	16.59	14.58	13.12	19.16	17.12	15.35	13.76
IMR (assumed)	136	133	130	121	136	133	130	121
c_0° (M)	46.4	48.6	50.7	52.9	46.4	48.6	50.7	52.9
c_0° (F)	44.7	47.8	50 9	54.0	44.7	47.8	50.9	54.0
Percentage couples effectively protected.	3.4	11.6	21.0	24.2	0.0	0.0	0.0	0.0

Table 7 : Age Accuracy Index by UN Secretariat Method, India 1951-71

Sl. No.	Census Year	Age Grouping	Age Ratio Score		Sex Ratio Score	Joint Score
			Male	Female		
1	2	3	4	5	6	7
India	1951	Single	95.7	107.6	6.3	222.2
		Quinquennial	11.2	14.3	6.6	45.3
	1961	Single	141.7	170.0	12.0	347.7
		Quinquennial	12.7	16.2	5.9	46.6
	1971	Single	175.2	198.6	10.0	403.9
		Quinquennial	11.0	11.5	4.4	35.7
Sweden	1935	Quinquennial	2.0	1.8	1.6	8.6
	1940	Quinquennial	2.5	2.3	1.1	8.1
	1945	Quinquennial	3.2	3.1	1.1	9.6

Source : Various reports of Census of India and Swedish Censuses.

Table 8 : Underenumeration of Children Below 5 Years of Age, 1951-71

Census Year	Percentage of children aged (0-4)				Percentage of under-enumeration	
	Enumerated		Adjusted			
	Male	Female	Male	Female	Male	Female
1	2	3	4	5	6	7
1951	13.2	13.9	14.3	14.7	7.1	5.8
1961	14.7	15.5	16.2	16.9	9.6	8.1
1971	14.1	14.9	15.9	16.4	11.2	9.2

Source : Computed from Census of India Publication on Age Tables for 1951, 1961 and 1971 Censuses.

PAPERS OF SESSION III

MIGRATION INTO THE TERAI REGION OF NEPAL

VIDYA BIR SINGH KANSAKAR

Geographical Background of the Terai Region

The Terai region of Nepal is a narrow strip of alluvial plains extending from east to west along the foothills of the Himalaya mountains. The east to west continuity of the Terai in Nepal is broken at two places where they constitute the Indian territory and where the boundary of Nepal with India is the Churiya or the Siwalik hills. However, in the Terai region of Nepal the boundary between Nepal and India is the 10 yards-wide no-man's land as artificial boundary in most places and also rivers as natural boundary in certain places. Geographically the Terai plain constitutes the northern extremity of the Ganges plains. The average elevation of the Terai plain is 200 metres above sea level and the width of the Terai plain in Nepal nowhere exceeds more than 45 kilometres. The Terai plain has been formed by the deposition of alluvium brought down by multitude of rivers having their sources in the glaciers, springs and rains from the Himalayas. The southern part of the plain is known as proper Terai where the depth of the alluvium soil increases towards the south as the Churiya hills gradually disappear beneath it. A narrow strip of plain to the north of the proper Terai is known as Bhabar where the alluvium at depth is mixed with sands, pebbles and gravels as most of the Churiya hills disappear below the alluviual fans and most of the minor rivers and streams in this region have underground courses reappearing on entering the proper Terai.[1] The Terai region of Nepal is extensively cultivated and is known as granary of Nepal. The region is responsible for 59 per cent of the country's G.N.P. and 76 per cent of the country's revenue[2]. Upto the first half of the present century the Terai region of Nepal had remained as resource frontier areas of Nepal and ever since the launching of malaria eradication programme in the late fifties the Terai region became the centre of population immigration both from the hill region of Nepal as well as from India.

Migration and Development of the Terai in the 18th & 19th Century

Upto the end of the eighteenth century almost entire Terai belt of Nepal as well as that of India was covered with dense forests and were hyperendemic belts of malaria. However, the Terai region was interspersed with cultivated patches amidst the dense forests wherein the settlements of the malaria immune aborigin ethnic groups like Tharu, Dhimal, Rajbanshi, Sattar, Jhangar, Kumhal, etc. were located. In the historical past the Terai region had been the centres of great ancient civilization, such as the Lumbuni and the Kapilvastu areas where Buddha was born and spent his early years, Janakpur and surrounding areas which was the centre of Mithila empire and birth place of Sita. However, the fact that how such highly developed centres of civilization dwindled and turned into highly malarial areas has still remained as an enigma.

The unification of Nepal which started after the conquest of the Kathmandu Valley by King Prithvinarayan Shah in 1769 heralded the attempt at developing the Terai. The attempt at territorial expansion and consolidation for the unification of Nepal demanded large number of people in the armed forces as well as necessitated to increase the land revenue to meet the growing expenditure on defence, because the primary source of state income was land revenue. As the amount of land revenue was insufficient to meet the financial requirements of the state, the government assigned plots of land to the government employees in the form of birth and *jagir* as an emolument for services in lieu of cash salaries.[3]. *Birta* is the alienation of the state ownership of land made in favour of private individuals such as priests, soldiers, members of the nobility and the royal family for their loyal services, whereas *jagir* is the assignment of the revenue from the *raikar* land (state land cultivated by private individual in the capacity of tenant) as emolument of office to government employees in lieu of salary in cash. As the hill areas of the country were the main centres of population concentration, land for assignment particularly birta land was available in the Terai and the Inner Terrai which were however, highly malarial. The Inner Terai areas adjoining the Kathmandu Valley were being cultivated by the hill people who worked in the field during the day time and returned to the non-malarial hill slopes in the evening.[4] Because of the distance from the hills and problem of ecological adaptation to the hot, humid and malarial Terai, the hill people were reluctant to cultivate the Terai land. Moreover, the Terai could not be brought under cultivation through immigrants from India, because they were neither permitted to purchase land nor entitled to have tenurial rights. Thus large tracts of the Terai were covered by dense forests which were used by cattle herders of adjoining Indian territories of Champaran and other districts to graze cattle annually for four months (October to January) by paying duty which was levied on buffaloes and the cows were exempted from the levy.[5] Thus the land in the Terai represented an

[1] A. Ganser (1964) : *Geology of the Himalayas*, John Willey and Sons, Switzerland, pp. 146-47.

[2] Frederick H. Gaige (1975) : *Regionalism and National Unity in Nepal*, University of California Press, Berkeley, p. 26.

[3] Mahesh Chandra Regmi (1971) : *A Study in Nepali Economic History*, Manjushree Publishing House, New Delhi, pp. 38-41.

[4] William Kirpatrick (1811) : *An Account of the Kingdom of Nepal* W. Miller, London, p. 83.

[5] *Ibid.*, p. 18.

25—5 RGI/ND/84

important source of income for the royal family, nobles and high officials of Nepal. The attempt of the British to control the Terai areas of Nepal was the result of Anglo-Nepal war of 1814 in which Nepal was defeated at the hand of the British in 1815 and Nepal was forced to sign the peace treaty of Sugauli. Considering that the interest of the chiefs and nobles of Nepal depended on revenue from land, the British government in the article IV of the Sugauli treaty of 1816 agreed to settle pension to the aggregate amount of two lakhs of rupees per annum on chiefs who sufferred by land ceded to the British. However it was withdrawn when the British agreed to return the Eastern Terai between river Kosi and Rapti.[6] After the peace treaty of 1816, Nepal government from motive of policy has caused the inhabitants of the greater part of the Terai and the Inner Terai leading to Kathmandu from India to abandon and the areas were reverted to their natural state of forest. Strategically the malaria haunted Terai jungle of Nepal provided strong line of defence against the advances of any army of invasions from the plains of Hindustan, the malaria had brought to an end more attempted raids into Nepal and has buried more political hopes than will ever be known.[7] However, the attempt of the government to reclaim the other parts of the Terai to increase state revenue as well as the income of the royal family, noble and officials through measures like forced labour, incentives to the slaves and debtors who absconded, remission in rents, etc., did not materialise owing to the reluctance of the hill people to settle in the malarial Terai.[8]

Migration and Development of the Terai During the Rana Region

In recognition of the military assistance provided by Rana Prime Minister to the British government to quell the Sepoy Mutiny (First war of Indian independence) of 1857, the British government returned to Nepal the territory of the far western Terai ceded to India in the treaty of 1816. Jung Bahadur who came to power through massacre of the nobles and higher official and established autocratic and oligarchic rule in Nepal in 1846, tried to maximise income from the new territory for his family as well as for the state. In order to achieve his objectives, he incorporated a provision in the legal code of the country entitling alienation of land through sale or purchase to the foreign nationals residing in Nepal.[9] Thus large scale immigration of the Indians took place in the Terai and reclamation of the Terai forest for cultivation started. However, only those parts of the Terai were reclaimed for cultivation which were opened up in the Indian side while the Nepalese Terai north of the Indian forests could not be reclaimed owing to the higher endemicity of malaria[10]. Upto 1923 immigration of Indians to the Terai was confined to reclamation of the Terai for cultivation only. The permanent settlement of the traders and the businessmen to the Terai had been hindered by absence of permanent markets in the Terai on the one hand and refusal of the Nepal government to allow the Indian traders and businessmen to stay for a longer period in these market centres, because they had to cross the Nepalese border with their merchandise, sell the merchandise only at the bazaars, and then return with what they could not sell[11]. However, in the capital city of Kathmandu, there were several flourishing kothees (business house) of Indian merchants supplying imported luxuries to the royal family, the Ranas and other nobilities.[12] The market centres in the Terai bustled with activities during winter when the hill people come down to Terai to purchase grain and do a little smuggling of recruits for the Indian army[13]. Upto few years before the end of the 19th century, Nepalese government took strong measures to prevent its people in enlistment to the British army, because the British government had not yet recognised Nepal as sovereign and independent country. The Nepalese government was apprehensive of the extension of British domination in Nepal and regarding question of commerce and trade the government realised the dangers of British infiltration into Nepal through their custom of letting the flag follow trade.[14]. The British government wanted to extend its trade to Tibet through Nepal, and when they failed in this strategy, they concentrated their attention on Darjeeling and Sikkim routes for trade with Tibet[15] and eventually discovered trade route from India via Sikkim. However, in the reclamation of the Terai, the Nepalese government did not hesitate to seek the assistance of the British government.

During the World War I, 200,000 Nepalese representing 20 per cent of the eligible male population of the country had fought in every theatre of war, cheerfully enduring the tropical heat and the cold of

[6] Asad Husain (1970) : *British India's Relation with the Kingdom of Nepal*, George Allen and Unwin, London, p. 38.

[7] P. Landon (1928) : *Nepal*, Constable and Co., London, Vol. I, p. 172.

[8] Regmi, op. cit., pp. 190-91.

[9] Ministry of Law and Justice (1966) : *Legal Codes Formulated during the Reign of King Surendra Bikram Shah* (in Nepali) Kannon Byabastha Samithi, Kathmandu, p. 35.

[10] Vidya Bir Singh Kansakar (1980) : "Land Resettlement Policy as a Population Distribution Strategy in Nepal", paper presented at the *Symposium on Development and Population Redistribution in South Asia*, organised by Commission on Population Geography, International Geographical Union, Karachi, 4-10 January, 1980, p. 5.

[11] Husain, op. cit., p. 120.

[12] Brian, H. Hudgson (1874) : *Essays on the Language, Literature and Religion and Customs of those countries*, Trubner & Co. London, Part II, pp 93-8

[13] Husain, op. cit., p. 267.

[14] Francis Tuker (1957) : Gorkha : *The Story of Gurkhas of Nepal*, Constable & Co., London, p. 175.

[15] Sushila Tyagi (1974) : *Indo-Nepal Relations* (1858-1914), D.K. Publishing House, Delhi, p. 103.

the northern winters.[16]. The drain of dynamic and enterprising youth led to the deterioration of agriculture and food supply in the hills as well as loss of government revenue from land.[17] Moreover, there was difficulty of getting back the Gurkhas discharged from the army after the war. Large number of Gurkhas having been to India as also having seen a great deal of foreign countries, were loath to go back to their hard working life in the mountains. When these men found that they could earn several times more than what they would earn in the hill and also could lead life in comfort, they stayed back in India to work either as watchman or even in the police government or in many other position available to them, for many Indian merchants had a great belief in the Gurkhas as a honest and loyal servant.[18] Of the 10,932 Gurkhas discharged after the war, only 3,838 returned home in 1919.[19] In 1921 Nepal government availed the service of J. V. Collier, an Indian Forest Officer, for reclaiming the Terai forests for cultivation to increase the government revenue. The pretext put forward by Collier in favour of reclaiming the Terai had been "Nepal, with her growing population and with the tendency of her surplus manhood to emigrate into India must adopt and press forward a policy of tree felling in all localities where crops could grow and men live happily[20]. Collier was entrusted with the reclamation of large tracts of the Terai especially in the districts of Morang, Mahottari, Sarlahi, Chitawan, Surkhet, and Mailali-Kanchanpur.[21] But the reclamation programme failed to attract the hill people because of their inability to settle in the hot, humid and malarial environ of the Terai. The programme rather benefitted to Indian immigrants and more so to the Indian forest contractors to procure cheal sal tree (Shorea robusta) which constituted the much needed railway sleepers for the expansion of the Indian railways at that period. Timber for the railway became profitable item in Nepal's export trade. The total value of this trade with India increased from Rs. 14,073,870 in 1884-85 to Rs. 62,724,000 in 1923-24[22]. After his service with the Nepal government, Collier also entered into contract for extracting timber from the Terai forest of Kailali district and he extended a railway line from Gauri Phant on the Indo-Nepal border to Nepal Terai up to the foot of the Churiya hills. The rapidity with which he had extracted the timber from the forest that within few months he cleared unimaginable tracts of the forests and his action alarmed the government who was compelled to cancel the contract.

An important event in the development of the Terai heralded in after the signing of the Treaty of Friendship between Great Britain and Nepal in 21st December 1923, which had considerable bearing on migration of population to the Terai and its development. The treaty accorded Nepal as an independent and sovereign country and thus removed the apprehension lurking in the mind of the Nepalese government that Britain might at any moment annex Nepal into its colonial domain. The extension of Indian railway heads and railways along the Indo-Nepal border resulted in the growth of market centres and towns in the Nepalese Terai along the Indo-Nepal border, e.g., Nepalganj, Bethari (Bhairhawa or Siddharthanagar), Birgunj, Gaur, Jaleswar, Malangawa, Siraha, Hanumannagar, etc. In 1926, Nepal abolished slavery and a large number of slaves were rehabilitated in Bichhako (which was later named as Amlekhanj or free town) and was primarily concerned with the labour supply for the proposed railway construction from Raxaul, the Indian railway head on Indo-Nepal border to Amlekhganj[23].

In 1911, Nepal conducted first population census. However, the successive censuses upto 1942 were marked by unreliable population data, resulting from under enumeration. Apart from natural calamities and unprecedented historical events, the major reason behind large scale under enumeration had been attributed to various administrative constraints, e.g., inadequacy of the personnel to conduct the census operations, poor transport and communication linkage, corruptive practice among the enumerators to extort money from the respondents thereby discouraging the latter to participate in the census[24]. The census figures from 1911 to 1930 reveal absolute decline in the population of Nepal in general and that of Hill regions in particular, whereas that of the Terai is marked by absolute increase (Table 1). The share of the Terai in the total population of the country increased from 36.44 per cent in 1911 to 38.51 per cent in 1930. Considering the overall decline in the population in the country, the positive growth rate as well as increase in the share of population is an indicative of gradual inmigration in the Terai. The further spurt in the development and migration in the Terai took place in 1936 when Nepal initiated development of organised industries in Morang district and the World War II provided considerable boost to these industries and several other industries were established in other parts of the eastern Terai. As the Nepalese lacked skill to run such organised industries, the labour supply for running the industries including management had to be met through demanding them from India. Thus industrialization in the Terai further

[16] W.B. Northey and C.J. Morris (1928) : *The Gurkhas*, J. Lane, London, p. 26.

[17] C.G. Bruce (1928) "Forword" in *The Gurkas* by W.B. Northey and C.J. Morris J. Lane, London, p. xxvii.

[18] C.G. Bruce (1934) : *Himalayan Wanderer*, Maclehose, London, p. 267.

[19] Kanchanmoy Mojumdar (1973) : *Political Relation between India and Nepal*, Munshiram Mancharlal Publishers, Pvt. Ltd New Delhi, p. 198.

[20] J.V. Collier (1928) : "Forestry in Nepal" in *Nepal* by P. Landon, Constable & Co., London, Vol. II, pp. 252-53.

[21] Vidya Bir Singh Kansakar (1980) : "Policies Influencing Population Migration in Nepal", paper presented at the ILO Workshop of Technical Consultants in the Project GID/75/PO2 on State Policies and Internal Migration 28 April—1 May, 1980, Bangkok, p.6.

[22] Landon, op. cit., pp. 160-61.

[23] Mojumdar, op. cit., p. 244.

[24] Vidya Bir Singh Kansakar (1977) : *Population Censuses of Nepal and Problem of Data Analysis*, Centre for Economic Development and Administration, Kathmandu, pp. 3-5, 7-17.

Table 1: Nepal : Distribution and Growth of Population 1911—1981

Year	Nepal	Growth	Terai (including Inner Terai)	Growth Rate	Hill	Growth Rate
1911	5,638,749 (100.00)		2,054,959 (36.44)		3,583,790 (63.56)	
1920	5,573,788 (100.00)	—0.13	2,122,036 (38.07)	0.36	3,341,752 (61.93)	—0.42
1930	5,532,574 (100.00)	—0.02	2,130,487 (38.51)	0.04	3,402,086 (61.49)	—0.14
1942	6,283,649 (100.00)	+1.07	2,213,920 (35.23)	0.32	4,069,729 (64.77)	1.50
1952/54*	8,473,478 (100.00)	+2.68	2,803,225 (33.08)	2.38	5,670,253 (66.92)	2.59
1952/54†	8,256,625 (100.00)		2,863,202 (34.68)		5,393,423 (65.32)	
1961	9,412,996 (100.00)	+1.77	3,427,886 (36.42)	2.23	5,985,110 (63.58)	1.48
1971†	11,555,983 (100.00)	+2.07	4,776,506 (41.33)	3.37	6,779,477 (58.67)	1.25
1971‡	11,555,983 (100.00)		4,828,736 (41.79)		6,727,247 (58.21)	
1981	15,020,451 (100.00)		7,149,054 (47.60)	4.00	7,871,397 (52.40)	1.58

Source : Population Census of Nepal 1952/54, 1961, 1971 and 1981 (Preliminary Results).

*including population absent.

†excluding population absent, adjustment of population ceded from Dhading and Kabrepalanchok (Hills) to Chisapani (Inner Terai) resulted in higher proportion of Population in the Terai despite exclusion of absent population.

†based on district boundary prior to 1975.

‡based on district boundary after 1975.

Figure in parenthesis is population distribution in per cent.

augmented the immigration of Indians to the Terai. During the World War II when the Japanese overran Burma, a large number of Nepalese living in Burma fled towards Nepal. The Indian government established camps in Motihari (Bihar State) for their temporary rehabilitation.[25] Some of the Nepalese entered Nepal and most of them settled permanently in Dharan and in and around Butwal in the Terai. The census of 1942 failed to reveal immigation to the Terai. The census figures is very much untanable, because it revealed very low rate of growth in the Terai, while the hill region which characterised by large scale emigration during the war, recorded, high growth rate. The Indo-Nepal Treaty of Peace and Friendship of 1950 between the new government of India and the then Rana government gave a strong impetus to the migration of Nepalese to India and the Indians to Nepal. The treaty agreed to grant, on reciprocal basis, to nationals of one country in the territories of the other the same privileges in matter of residence, ownership of property, participation in trade and commerce, movement and other privileges of a similar nature. As a result of this Treaty, a large number of Indians migrated to their traditional destination of migration, that is the Terai.

The post war period ever since 1815 was marked by continuous granting of waste lands to individuals for reclamation, but these were due more to a desire for personal enrichment on the part of recipients than to the government's programme for development.[26] During the Rana period the granting of waste lands was further intensified for themselves, their families, favourities and supporters, while majority of people were deprived of this opportunity and they were compelled to emigrate to India in search of employment opportunities to alleviate their improved conditions. The oligarchic and autocratic regime of the Ranas adopted measures to confiscate the *Birta* lands of the rivals and even confiscated the *raiker* lands and converted into *birta* lands on different pretext and distributed among their families, relatives, favourities and

[25] H.M.S.O. (1965) : *Nepal and the Gurkhas*, London, p. 31.

[26] Regmi (1971): op. cit., p. 190.

supporters. Thus, migration from hills to the Terai was insignificant as compared to immigation from India to the Terai during the Rana regime.

Migration and Development of the Terai since 1951

After the installation of democracy in the country in 1951, large number of Nepalese exiled to India during the Rana regime as well as those domiciled Nepalese from India and Burma came back to Nepal with aspiration for a better future. The new government became aware of the population problems of the country and there was increasing realisation of the need for people oriented development strategies as against ruling class oriented strategies of the Rana regime. As the resource base of the country was too weak to bring about changes in the existing over-whelmingly agricultural economy and to increase employment opportunities in non-agricultural sector, the two strategies that the Government adopted to deal with the population problems of the country were the redistribution of population in the agriculturally potential forest areas of the Terai and the Inner Terai, and the change in the land tenure system to accommodate the surplus labour force within the existing land.[27] However, the land reform up to 1959 had only medelled the land tenure system of the country to widen the land tax base of the country rather than to benefit the peasants and the landless labour.[28]

Planned Land Settlement Programme in the Terai

The monsoon flood have of 1954 and resulting floods and landslides necessities the government to rehabilitate the victims and to redistribute the landless population in the new areas. In 1956 Nepal initiated the first Five Year Plan (1956-60). The Rapti Valley Development Programme was launched in Chitawan district in the same year with the aim of relieving the pressure of population in some areas, rehabilitating the landless peasants and solving partially the food problem of the Kathmandu Valley.[29] Only after the launching of the malaria eradication programme in 1958 under the tripartite agreement of Nepal government, U.S. O.M. (USAID) and WHO, the programme could be materialized. Malaria eradication in the Rapti Valley (Chitawan), the first in Nepal, marked the large scale migration of the hill people to the Terai and the Inner Terai. The growth of population in Chitawan between 1954-61 was 6.34 per cent per annum as against 1.77 for the country and 2.23 for the Terai. As the number of migrants in the Rapti Valley greatly exceeded the land set aside for settlement, there were several illegal encroachment in the reserved and protected forests resulting from the malfeasance in distribution of land in which nepotism, favouritism and corruption dominated the scene, and as a result genuine landless peasants and flood victims could not get the land.[30] The subsequent eradication of malaria in other parts of the Terai and the Inner Terai was accompanied by large scale migration of the hill people to these areas. By the time the Terai became opened up for the hill people, after the eradication of malaria, a large part of the Terai particularly the Terai proper had been owned, cultivated and tilled by the people of the Indian origin in particular and also by the malaria immune indigenous ethnic groups, and for the migrants from the hills the only alternative available was to encroach the government forest lands usually north of the Terai proper. Out of the total population absent from home for more than 6 months in the country, largest number of out-migrants in the country is from the hill region accounting for 98 per cent of the total and 94 per cent of the total respectively in 1952/54 and 1961, representing 3.96 per cent and 5.88 per cent of the total population of hill region respectively. Out of the total out-migrants from the hills internal migrants constituted 7.14 per cent in 1952/54 and increased to 11.5 per cent in 1961 and in terms of absolute number it increased from 15,192 in 1952/54 to 39,714 in 1961. As a result of internal migration and immigration, the Terai districts where high growth rate had been recorded had close relationship with higher percentage of population born outside (Table 2).[31]

Table 2 : Population Growth of Some Selected Districts of Teral

Districts	Growth Rate (1952/54-61)	Percentage of Population born Outside		
		Total	Native born*	Foreign born
Chitawan	6.84	31.9	31.3	0.8
Jhapa	4.56	42.2	20.3	21.9
Biratnagar	4.00	28.2	13.6	14.6
Majhkhand	2.69	29.6	5.7	23.9
Palhi	2.56	25.1	2.8	22.3
Bardia	2.30	22.2	17.7	4.5
Mahottari	2.23	16.6	7.2	9.4
Sarlahi	2.17	20.2	11.4	8.8
Kailali	2.14	14.7	13.8	0.9

Source : Population Census of Nepal 1952/54 and 1961.
*Born in other parts of the country but enumerated in Terai.

[27] Kansakar (1980), op. cit., p. 7.

[28] Mahesh Chandra Regmi (1976) : *Landownership in Nepal*, University of California Press, Berkeley, p. 45.

[29] Nepal Government (1956) : *Brief Draft of the Five Year Plan*, (in Nepali), Nepal Press, Kathmandu, pp. 70-71.

[30] Vidya Bir Singh Kansakar (1979) : *Effectiveness of Planned Resettlement Programme in Nepal*, Centre for Economic Development and Administration, Kathmandu, pp. 32-33.

[31] Vidya Bir Singh Kansakar (1974): *Population Change in Nepal : A Study of Mobility during* 1911-1951, Patna University, Patna (Unpublished Ph. D. Thesis) pp. 98-99.

Out of the total 760,002 persons in the country having birth place outside the place of the enumeration, 558,933 persons or 73.5 per cent were recorded in the Terai. Of those born outside the place of enumeration but the enumerated in the Terai, 43.9 per cent were born within the country and 56.1 per cent outside the country. Regarding population born in the other districts 58.0 per cent of the country's total were enumerated in the Terai, while out of 337,620 foreign born population in the country, 313,794 or 92.9 per cent were recorded in the Terai. The Indian-born population numbering 310,465 or 92.0 per cent of the total foreign-born population in Nepal were concentrated in the Terai. The Indian nationals which is one-third of the Indian-born population and their concentration in the Terai is only 68.8 per cent of the total Indian nationals. Population born outside the Terai constitutes 18.2 per cent of the Terai population while foreign-born population accounts for 10.2 per cent of the Terai population.

The census of 1971 indicated 713,480 persons born outside Terai as against 558,933 persons in 1961, an increase of 154,556 persons. Assuming the survival rate of 0.87 for the population born outside Terai, the increase will be 227,217 persons. The census failed to indicate the magnitude of migration from within and outside the country because the share of the population born outside declined from 18.24 per cent in 1961 to 16.42 per cent in 1971. Assuming the national growth rate of 2.07 per cent between 1961-71 for the Terai, the population of Terai in 1971 will be 3,768,315 as against the census figure of 4,345,966 and the difference between the two figures is 577,651 persons which seems to be the net migration in the Terai between the period of 1961 and 1971. Population born in other district but enumerated in the Terai increased from 245,139 persons in 1961 to 399,925 persons in 1971 and with the assumption of the survival rate of 0.87 for the population born outside the Terai, 186,654 persons seems to have been migrated from the hill region. Regarding the foreign born population in the Terai it declined from 313,794 persons in 1961 to 313,564 in 1971, but with the assumption of survival rate of 0.87 foreign born population in the Terai seems to have increased by 40,563 persons between 1961 and 1971, while the increase in the India-born population is only 18,211 persons. However, the Indian nationals in the Terai has increased from 75,752 in 1961 to 124,446 in 1971, an increase of 48,694 persons. The census figures on migration is quite untenable and it must be due to migration being a sensitive issue. Regarding internal migration in the Terai, it is characterised by male selectivity, while in the case of external migration it is characterised by female selectivity which is basically related to marriage migration owing to the similarity in culture on either side of the Indo-Nepal border. The proportion of females in the India-born population is 65 per cent. Similarly, in India the proportion of females in Nepal-born population is 85.2 per cent in Bihar and 50.6 per cent in Uttar Pradesh. However, the proportion in the Indian nationals is characterised by higher proportion of males (53.2 per cent) with more than 60 per cent in the age group between 15 to 49 years of age.

The Terai region of Nepal is experiencing ever increasing rate of growth of population. The population growth between 1971 and 1981 is highest ever recorded growth in the country. The annual rate of population growth in the Terai is 4.07 which is more than twice the growth rate of the Hill region (Table 3).

Table 3 : Distribution and Growth of Population in Nepal 1971-81

Region	Population		Absolute Increase	Annual Growth Rate
	1981	1971		
Terai	6,559,525 (43.67)	4,401,870 (38.09)	2,157,655 (62.28)	4.07
Hill	8,460,426 (56.33)	7,154,113 (61.91)	1,306,813 (37.12)	1.69
Nepal	15,020,451 (100.00)	11,555,983 (100.00)	3,464,468 (100.00)	2.66

Source : Census of Nepal 1981 (Provisional figure) and 1971.

Table 3 shows that the population of the Terai doubled in 1961. According to the Terai region defined by the government, the population of the Terai in 1961 was 3,069,504 which increased to 6,59,525 in 1981. Thus the population of the Terai has more than doubled within last 20 years. Assuming national average growth rate for the Terai, the population of the Terai will be 5,721,545 as against 6,559,525 as revealed by the 1981 census. Thus migration has added 837,982 persons in the population of the Terai between 1971 and 1981.

Population growth in the Terai districts show that excepting Siraha and Mahottari districts, all the districts are characterised by growth rate above national average (Table 4). The highest growth rate has been recorded in Kanchanpur (9.20) where population has more than doubled between 1971 and 1981. Kanchanpur is followed by Bardia (6.90), Jhapa (6.75), Kailali (6.62) and Morang (6.25). Because of high growth rate in the Terai, out of the 20 districts ranking highest among the districts in the country according to the population size, 18 districts belong to the

Terai, the corresponding figure in 1971 was only 13. As the high growth rate in the Terai region is related to large scale migration, population in the Terai is experiencing ever-increasing preponderance of males over females. The sex ratio of the Terai in 1961 was 1,026 (males per 1000 females) and increased to 1,059 in 1971 and 1,064 in 1981.

Migration and development in the Terai has contributed towards rapid unbanization. Out of a total of 16 urban centres in 1971, 9 urban centres were located in the Terai and the number has increased to 14 out of a total of 23 in 1981. The share of the Terai in the urban population of Nepal has increased from 38.8 per cent in 1971 to 48.3 per cent in 1981. According to the census of 1981 the urban population in the Terai accounted for 7.04 per cent of the total population in the Terai. The pace of urbanisation in Nepal in general is very slow because of the very slow development of activities outside agriculture. However, the Terai is experiencing a rapid growth of urban centres with the growth of commerce and industry. With the growth of transportation facilities urban centres in the Terai are experiencing dispersion rather than concentration, that is, development of new urban centres rather than the expansion of the existing urban centres.[32] Recently, the government has declared 6 more settlements as towns and 4 of them lie in the Terai.

Implications of Migration in the Terai Region

Large scale migration of population in the Terai region has considerable implication on demographic, economic, environmental, and political aspects of the country in general and the Terai in particular.

High growth of population in the Terai due to migration is gradually increasing the share of the Terai in the total population of Nepal. With less than ¼ (one-fourth) of the country's total land area, the Terai region has 43.67 per cent of the total population of Nepal and if the present trend of migration is to continue, the Terai region will have more than 50 per cent of the total population of Nepal before the end of this century. Thus the share of the Terai in government investment on population will gradually increase. Moreover, considering the concentration of transport facilities (three-fourths of the permanent airports and 58 per cent of the roads) in the Terai and the case of movement coupled with the large size of the settlement, the government's priority area in investment will be the Terai region, because any programme in the Terai will have large population coverage and the cost of delivery will be low as compared to the Hill region which lacks transport infrastructures and characterised by uneven and scattered distribution of population.[33] As migration is characterised by predominantly male and dynamic age groups, the Terai will gain by such migration, while the depletion of this group in the hill will have adverse impact on development of the hill areas.

Malaria eradication in the Terai and accompanying agricultural and industrial development accentuated the migration from the hill region as well as immigration from India. Reclamation of the Terai for agriculture further increased the demand for labour which usually came from India is closely related with the prevailing large land holdings and absentee landlordism in the Terai. Moreover, cultivation of land by the immigrant labour precludes the risk of according tenurial right to the tillers. Migrant labour for agriculture in the Terai is mostly from India, who is landless and is attracted by agricultural wage in Nepal which is considerably higher than in neighbouring areas of India.[34] The investment in the Terai in the non-agriculture sector also demanded for a large number of skilled, semi-skilled and unskilled labour. The predominantly rural agrarian economic structure of the hill region is unable to fulfil these demands and moreover, the unskilled hill people had a long tradition of and preference for emigrating to India for employment in army service and other economic opportunities. The existence of these avenues has tended to postpone the necessity of responding to the pressure of population in the hill region and crisis arising out of it since a long time and the postponement since 1950's has been further buttressed by availability of reclaimable land in the Terai and government sponsored programmes of land settlement. The Terai region of Nepal accounts for 65 per cent of the total cultivated land in Nepal, more than 70 per cent of the country's foodgrains and most of the cash crops such as jute, sugarcane, tobacco and oilseeds, most of the large irrigation schemes, and a large industrial base. The Terai also contributes considerably in the country's economy by export of foodgrains and other agricultural surpluses, timber and industrial products based on agriculture and forests. Given the critical state of the hill economy the answer—or more precisely, the hope—for the future must lie with the demonstrated ability of the Terai to produce substantial foodgrain surpluses in addition to other crops, such as jute, sugarcane, and mustard, which provide raw materials to the only significant centres of industrial production in Nepal. Unless productivity in both the hills and the Terai can be raised, in both agriculture and industry, and unless measures are taken to encourage indigenous production and also to ensure that the surpluses produced within Nepal do not merely leak out through illegal transactions across the Nepalese-Indian border, the hope that the Terai offers for the future will prove illusory; the existing surpluses will be eaten away by the growing local population and the hill economy and state revenue will collapse, resulting in still fur-

[32] Ibid, p. 416.

[33] Vidya Bir Singh Kansakar (1981); *Scenario Analysis of the Basic Minimum Needs for Nepal*: 2000 *A.D.* Centre for Economic Development and Administration, Kathmandu, p. 259.

[34] Piers Blackie, John Cameron and David Seddon (1980): *Nepal in Crisis: Growth and Stagnation at the Periphery*. Oxford University Press, Delhi, 243.

ther economic and political changes.[35] In spite of the increasing priority given to the agriculture sector in the last decade the performance shows a declining trend and the continuation of which might make Nepal a foodgrains importing country in near future.[36] The recent drought in the country has already indicated that prospect. The Terai has not been able to exploit the industrial potentiality owing to the policy of trade protectionism in India since British period and thus hindering the prospect of the absorption of country's surplus labour force. During the World War II, the Rana government requested the Indian government to extend the free custom corridor, which was at that time available for goods delivered to Kathmandu, to the Terai, in order to develop industries in the Terai. Realising that Nepal would like to export manufactured goods to India as well the British government took this matter seriously. Instead of industrial development the British government persuaded Nepal to undertake the task of controlling and developing hydro-electric power, because Nepal rivers caused considerable damage in British India. The British government decided to enlarge the free customs corridor so as to permit the import of goods—especially capital plant—into the Terai within reasonable limits not much in excess of Nepal's own requirement. By that time the British government has increased the annual 'present' to Nepal from Rs. 10 lakhs after the World War I, to Rs. 20 lakhs in perpetuity for providing the Gurkhas. The British government wanted to capitalise a part of that sum for Nepal's industrial development.[37] Thus, since the British India, treaties between Nepal and India regarding trade and transit of particularly crucial importance to a small, poor, land-locked country have so far tended to regulate rather than encourage Nepalese exports.[38] Nepal's economic needs should be treated with the maximum understanding and generosity even if India has to suffer minor losses here and there, and provided no grave damage is done to the Indian economy. India's unwillingness to adopt such attitude has been due to the diversion of import and export between Nepal and India in which a particularly unsavoury group of Indian businessmen in Nepal have been the main promoters as well as beneficiaries of the various rackets. If allowed unchecked, the activities of these ugly Indians may do uncalculable damage to India-Nepal relations.[39] The unregulated open border between Nepal and India has been responsible for unhealthy aspect of migration and movement of population and goods between the two countries. Any attempt at developing industry, commerce, trade, etc. in the Terai has actually benefited the Indian immigrants who by the virtue of their comparatively high level of skill and entrepreneurship have made it very difficult for the comparatively less skilled and less enterprising Nepalese to compete with them. Thus most of the hill migrants to the Terai had to content with agriculture in the newly opened up areas mostly in the less productive Bhabar area of the Terai.

Large scale migration in the Terai has been accompanied by large scale destruction of the valuable forest wealth of the Terai. The extent of deforestation during the half century (1927-77) was the extent of nearly sixty per cent. The increase of population during the same period was over 163 per cent in the Terai region.[40] Since last 25 years the process of the destruction forests has been accentuated by large scale migration of the population both from the Hill region and India as well as the failure of the government sponsored land settlement programme in accommodating the target groups and providing land suitable for pursuing fruitful agricultural pursuits, because land allotted under the government sponsored settlement programme were those which have been rejected for centuries by the indigenous settlers as unsuitable for cultivation. In 1964 the government enforced major land reform and imposed ceiling on ownership of land to a maximum of 25 bighas or 16.4 hectares and also hoped for redeeming excess lands for redistribution to the landless. As the land reform was enforced throughout country in stages, there was a large scale practice of anticipatory measures by the landlords such as redistribution of lands among their families and relatives, alienation through sale to others, and registering themselves as cultivators by evicting tenants. The excess of lands above ceiling turned out to be 50,000 hectares. However, nobody knows what happened of those excess lands. In 1964, Nepal Resettlement Company was established with an objective to settle landless people and to control forest encroachment. As the forest encroachment had spread like bush fire throughout the Terai region, the government established Resettlement Department to tackle the problem at national level. As the land allotted under government programme was not good for agriculture and at the same time the administrative procedures involved in getting land, was too lengthy, thus discouraging the landless, who had to maintain livelihood by daily earnings, to apply for settlement under the government programme. Again the failure of the programme in developing mechanism to detect the landless resulted in the accommodation of non-target groups. Furthermore, the deviation in the policy of selecting target groups from landless and natural calamity victims to the target groups like ex-armymen and political sufferers (mostly workers of the political parties before 1960), irrespective of their economic status the

[35] *Ibid*, p. 19.

[36] Harkha Gurung (Nov. 1981): *Food System and Society in Nepal: An Overview*, New Era, Kathmandu, p. 45.

[37] Nicholas Mansergh, ed. (1976): India: The Transfer of Power H.M.G. London, Vol. VI, Document No. 20 "Letter of Field Marshall Viscount Wanell to Mr. Pethik-Lawrence, 12 August 1945", p. 62.

[38] Blackie, et. ae. (1980), p. 12.

[39] Inder Malhotra (June 12, 1970): "India-Nepal Relations: Delhi's Diplomacy on Trial", The Statesman, Calcutta, p. 6 (quoted by Gaize, 1975).

[40] New Era (1981): *Study on Inter-Regional Migration in Nepal*. Kathmandu, p. 111.

programme of resettlement emerged as policy of appeasement rather than actual land resettlement[41] because both of these latter groups are vulnerable to the government if neglected. In the revolution of 1950 against the Rana regime, the Gurkha ex-armymen had been mobilized. Owing to the absence of industrial development and a lack of employment and investment opportunities in non-agricultural sectors, land is considered not only as a stable source of income and the most desirable form of property, but also as a symbol of high social and economic status. Thus the craze for owning a piece of land is ever-increasing and the general impoverished nature of the hill population has been the major factor behind illegal encroachment in the Terai forests with the involvement of one's own labour rather than any monetary investment. Forest encroachment in the Terai has reached to such a magnitude that forest coverage in the Terai has gone down to 19 per cent of the land area in the Terai as against the minimum requirement of 33 per cent to maintain ecological balance.[42]. The large scale destruction of forests in the Bhabar region which used to work as check for the fast flowing rivers of the hills on entering the Terai has not only resulted floods in the proper Terai plain, but also resulted in drying up of the streams, rivulets and springs. The environmental stress that has resulted from the destruction of forests not only affected agriculture, but also the supply of timber fuelwood and forage.

Conclusion

Migration to the Terai region has not been accompanied by development of agriculture and industry in the same magnitude as such the stress of population on the resources of the Terai region has become apparent. Accommodation of population is not possible through the extension of cultivable land because forest coverage has gone down to far below critical minimum required for maintaining environmental balance. Accomodation in non-agricultural sectors is not possible unless immigration is controlled. Regarding the first issue, intensive development in agriculture is possible through the provision of irrigation because 10 percent of the cultivated land in Nepal has access to irrigation. Along with the development of the Terai region the development of the hill region should also go side by side to minimise migration flow from the hill region. International migration being a bilateral issue between Nepal and India, because Nepal receives largest number of immigrants from India and large number of Nepalese emigrants has a destination to India, the solution to the second issue which is both sensitive and important lies in proper assessment of Indo-Nepal migration and understanding of its diverse perspectives by both countries.

---

[41] Kansakar (1978), p. 249-80.

[42] UNFPA (October 1980): "Report of the Working Group on Land Resettlement for Project Identification on Population Needs", Kathmandu, p. 3.

MIGRATION TO CITIES IN INDIA

MAHENDRA K. PREMI

Introduction

As more and more nations in Africa and Asia became independent from the colonial rule after the Second World War, they began their programmes of economic and social development to improve the levels of living of their people. This led to exploitation of natural resources, growth of industries, and development of infrastructural facilities on the one hand, and rapid urbanization on the other. As the major investments for the development of industries in many less-developed countries were made in the already existing dominant urban centres—generally developed by the colonial rulers as centres of trade and commerce, and the seat of the government—they developed further and very fast due to unprecedented rates of inmigration. This, in turn, led to the accentuation of primacy of one city in the urban hierarchy in many countries. The most striking example is of Bangkok (Thailand) which is about forty-five times larger than Chiang Mai, the next largest city in that country. This phenomenon is found to a somewhat lesser degree in Afghanistan, Burma, Iran, the Phillippines and the Republic of Korea (United Nations, ESCAP, n.d. : 3).

In comparison, the Indian urbanisation scene has been quite different. At the turn of the century 25.9 million persons, or 10.8 per cent of the country's population lived in urban areas. The proportion of urban population to the total did not change in any appreciable manner until the 1921 census, after which the same increased gradually. By 1971, one-fifth of India's population had become urban and in 1981, the urban population constituted 23.7 per cent of the total population of the country (excluding Assam, and Jammu and Kashmir) (Table 1). The gain in the proportion of urban population to the total over the past four censuses may seem modest, specially in relation to the gains achieved by many other less-developed countries since the Second World War; but between 1951 and 1981, India's urban population became two-and-a-half times from 62.4 million to 156.2 million. This was the third largest urban population in the World and was much higher than the total population of any country except China, the Soviet Union, and the United States in 1980/81.

In 1901 there were 25 cities, each with a population of 100,000 and above, accounting for a quarter (25.8 per cent) of the urban population. The biggest city was not even twice as large in size as the next city. In contrast, in 1981 the number of urban agglomerations and cities with population 100,000 and above increased to 216 (excluding Assam and Jammu and Kashmir) accounting for 94.3 million persons that is 60.4 per cent of the urban population or 14.3 per cent of the total population (Table 1). The largest metropolis, Calcutta, with a population of 9.17 million was closely followed by Greater Bombay with 8.23 million persons. In fact, there were 12 metropolises with a population of one million or over.

Table 1 : Population of India by rural, urban residence and number and population of urban agglomerations and cities of 100,000 and above persons, 1901-1981

Year	Population (in millions)			Per cent distribution		Cities with Population 100,000+		
	Total	Rural	Urban	Rural	Urban	No.	Population (in million)	Per cent of total urban population
1901	238.4	212.5	25.9	89.2	10.8	25	6.7	25.8
1911	252.1	226.1	25.9	89.7	10.3	24	7.1	27.2
1921	251.3	223.2	28.1	88.8	11.2	29	8.3	28.9
1931	279.0	245.4	33.5	88.0	12.0	34	10.3	30.0
1941	318.7	274.4	44.2	86.1	13.9	48	16.7	36.8
1951	361.1	298.7	62.4	82.7	17.3	75	25.6	43.4
1961	439.2	360.2	78.9*	82.0	18.0	105	40.0	50.2
1971	548.2	439.0	109.1*	80.1	19.9	148	60.9	55.8
1981†						216	94.3	60.4

Note. : 1. The number of cities is affected by changes in the concept of town, town group, and urban agglomeration besides demographic changes between one census and another.

*The figures prior to 1961 and from 1961 onward are not strictly comparable because of change in definition of urban areas on the eve of the 1961 Census when the same became stringent. For the two definitions, see Srivastava, 1972: (95-98).

†Figures exclude Assam and Jammu and Kashmir where the 1981 Census could not be conducted synchronously. Census in Assam has not been conducted to date.

Sources: Census of India 1971 (1975:201-05); Census of India 1981 (1981: 59).

It is generally believed that cities in India have been growing very fast, basically due to migration from rural areas and smaller urban settlements. Further migration to cities is male selective which turns the sex ratio in the cities more in favour of males. For example, Zachariah (1968) showed that migrants in Greater Bombay formed a selected group with respect to age, sex, marital status and family status. There was an excess of adolescents and young adults among migrants as compared to non-migrants in Bombay as well as the general population at the places of origin. The nigh sex ratio (males per 100 females) among migrants was due not only to high rates of inmigration of single males as compared to single females, but also to migration of married males unaccompanied by wives and children. Mitra (1967) observed that the sex ratio, although above 100, became somewhat favourable to females with longer duration of residence. Analysing the 1971 census data on migrants to urban agglomerations and cities with population 100,000 and over (called class I cities in the Indian census), Mitra et al. (1980) have concluded that the bulk of the migrants to cities came from the rural areas. Inter-state migration of adult males exceeded intrastate migration in the bigger class I cities, that is, rural migrants to these cities also came from far off rural areas. Intradistrict migration was, nevertheless, prominant in smaller class I cities.

The Government of India has been making serious efforts to bring down its growth of population to the replacement level, that is, net reproduction rate of unity. Assuming that the same would be achieved by the end of the present century, the major factors in future urban growth will be the emergence of new towns or cities and migration to the existing cities and towns. A study of cityward migration in India, therefore, becomes very relevant. It gains further importance because, so far, the trend of migration, its causes and implications on demographic, social and economic development have not been well understood.

With these aspects in view, utilizing the 1971 census data[1] on migration, this paper provides an improved documentation of the pattern of migration to 100,000 + cities in India and examines some of the demographic, economic and social characteristics of the migrants in comparison to the non-migrants. The paper also envisages to bring out certain desirable policies and programmes of population distribution for the next two decades or so.

Data Base and Derived Tables

Data Base

Information on migrants was collected in the 1971 census by canvassing the following three questions:

1. Birth place
   (a) Place of birth
   (b) Rural/Urban[2]
   (c) District
   (d) State/Country
2. Last residence
   (a) Place of last residence
   (b) Rural/Urban[2]
   (c) District
   (d) State/Country
3. Duration of residence at the village or town of enumeration.

These questions along with certain other items of information obtained in the "individual slip"[3] made it possible to generate several tables regarding the migrants in the country, and for the inmigrants to all urban agglomerations and cities with population 100,000 and above. Specifically, information contained in the following three tables has been utilized in the present analysis:

(1 Migrants to cities classified by sex, broad age groups, educational level, and, in case of workers, by occupational divisions.

This table is prepared only for cities and urban agglomerations of 100,000+ population and relates to migrants on the basis of "place of last residence." This provides an indication of occupations that attract migrants to cities. The educational standards give an insight into the skilled and unskilled labour.

(2) Workers and non-workers according to main activity classified by place of last residence.

This table provides information on quantum of migrants to class I cities by their place of last residence—rural or urban, intradistrict, interdistrict, or interstate, and from countries outside India. Workers in this table are classified into nine industrial categories.

(3) Migrants classified by place of last residence, sex, age groups, marital status, and duration of residence.

Data on certain characteristics of the total population of each city—its sex and age composition and

---

[1].It will still be quite a few years before the migration tables of the 1981 Census become available. Moreover, looking at the 1981 Census Tabulation Plan (Census of India 1981, 1980), it will not be possible to make as detailed an analysis of the pattern of migration and characteristics of migration as one could make from the 1961 or 1971 censuses, hence the work in this paper is based on the analysis of 1971 census data.

A large number of tables are based on reasons for "work" the comparison with 1971 will not be possible.

[2].For those born outside the village or town of enumeration, the rural or urban status was taken as at the time of birth of the migrant. In the case of last residence, rural and urban status was determined with reference to the time of migration from the place of last previous residence. (Census of India 1971, 1975: 18-19).

[3].The form in which information is collected about each person in the Indian Population Census is known as "Individual Slip". For the "Individual Slip" used in the 1971 Census and instructions to enumerators to fill the same, see Census of India 1971 (1975: 12, 16-24).

that of the workers, numbers of literate and educated persons, and industrial classification of workers—are also available from the census. These data, in conjunction with data on migrants, help in making comparisons of the certain characteristics of the migrants and the non-migrants.

Some limitations of the migration data emanating from the census may be mentioned here before discussing the analytical framework. First, some of the urban agglomerations are composed of a number of cities and towns. For example, in 1971, Calcutta agglomeration comprised 73 settlements of which 10 were with population 100,000 and above besides Calcutta. In treating urban agglomeration as one unit separate information is lost for such cities. Second, at the time of processing of data, migration tables were not available for Shillong, a city with 122,752 population in 1971. Data on sex, age and marital status of the migrants pertaining to Calcutta, Trivandrum, Calicut, Cochin, Alleppy, Quilon and Farrukhabad-cum-Fatehgarh were defective and these cities had to be deleted from analysis relating to these characteristics. Third, since Calcutta, Greater Bombay, and Madras, each formed a separate district, the question of migrants from within the district of enumeration did not arise. Similarly, in case of the Union Territories of Chandigarh and Delhi, there were no migrants from other districts of the same state/union territory as these union territories are not divided further into districts. Fourth, the published data had several typographical errors. Although every effort was made to correct those errors but some could not be corrected and this has limited the scope of the analysis. Finally, migration tables for each city were generated from a 20 per cent sample selected systematically from the "individual slips". Because of large sampling error in the cell values of detailed cross-tables, many of these figures are not reliable. Analysis of migrant's and non-migrants characteristics involving details cross-tabulations has been consistently avoided.

Classification of Cities

As the cities in India differ from one another in several respects, a better understanding of the migration phenomenon can be obtained when they are grouped into categories on different axes. For example, it has been generally argued that the metropolises are the major magnets for the migrants, particularly long-distance migrants, and have been growing much faster than other cities. In order to determine the differentials in migration pattern and in the characteristics of the migrants by city size, they have been classified into the following four categories:

(a) 1,000,000+

(b) 500,000—999,999

(c) 200,000—499,999

(d) 100,000—199,999

An analysis of the growth of cities during 1951-71 the two decades of development planning—has shown that some cities had grown very fast while some others did not experience a growth rate even commensurate with their natural increase.[4] Since this is largely a result of the extent of net migration, I have classified the cities into three categories based on their growth rates:

(a) High growth rate, that is, higher than the growth rate of the nation's urban population during 1951-71.

(b) Medium growth rate, that is, growth rate falling between that of urban population and that of total population during 1951-71.

(c) Low growth rate, that is, growth rate below the national growth rate during 1951-71.

Although the cities generally perform diversified functions, yet it is possible to determine their functional specialization. Moreover, the pattern of migration to the cities, particularly the characteristics of the migrants, are likely to differ according to their main functions. Several methods have been developed in the past to determine functional specialization of the settlements (Harris, 1943; Pownall, 1953; Duncan and Reiss (1956); Lal, 1957; Ahmad, 1965; Mitra, 1967). Different methods, however, yield almost similar results when the classification is sufficiently broad. As the purpose of this study is to understand the pattern of migration according to the functional specialization of the cities, I have borrowed Mitra's functional Classification of Indian cities on the basis of 1971 census data since the same was readily available to me.[5] Instead of using his detailed classification based on the extent of accentuation of particular functions, I have, however, regrouped the cities into the following three categories:

(a) Manufacturing,

(b) Trade, Commerce, and Transport, etc.

(c) Other Services.

Some of the cities in India have been in existence as important centres of economic activity for a very long time while some others graduated to the class I category much later. Some of the cities came into existence only after Independence and have grown very fast, mostly through net inmigration, to fulfil the functions for which they were established. I have, therefore, classified the cities in the following categories according to the length of their existence:

(a) Cities having population of 100,000+ prior to 1901.

---

[4] In the absence of reliable statistics on birth and death rates of each city, I have assumed that the national exponential growth rate represented the natural growth rate of each city. Hence growth rates of all those cities wherein the same was lower than the national growth rate have been considered as non-commensurate with the natural increase rate.

[5] The functional classification of the 1971 cities (applying the methodology adopted for the classification of the 1961 cities) has not been published. I am grateful to Prof. Asok Mitra who readily lent it to me.

(b) Cities in existence prior to 1901 but graduated to class I between 1901 and 1951.

(c) Cities in existence prior to 1901 but graduated to class I since 1951.

(d) New Cities that came into existence after the turn of the century and attained class I status any time during 1901 and 1971.

Finally, India displays peculiar regional diversities in economic and socio-cultural characteristics, which has influenced the migration pattern to the cities and is partly influenced by it. The cities have, therefore, been classified into the following categories:

(a) North and north-eastern Himalayan mountain ranges including Assam plains.

(b) Punjab and Upper Ganga plains including Rajasthan desert region.

(c) Middle and lower Ganga plains.

(d) Central India plateau, north of Satpura range.

(e) Deccan plateau.

(f) Coastal plains of the Eastern and Western Ghats.

The cross-classification of cities on two axes indicated certain relationships. For example, an association was found between size of cities and their growth rates (Chi—square = 15.6 with 6 d.f., significant at 2 per cent level). Similarly, there was association between functional specialization and regional type (Chi—square = 28.3 with 10 d.f., significant at 1 per cent level). There was also significant association between regional type and growth rate. Because of these interaction effects it would have been more useful to classify the cities into further sub-categories considering these relationships for a better understanding of the migration process but this would have reduced the number of cities in each category very substantially and many of the categories would have gone without a single city. Hence, the cities were not classified beyond what is stated above.

Keeping the above aspects in view, in what follows, the pattern of migration and the characteristics of the migrants and, in some cases, non-migrants, have been analysed on the basis of 1971 census data of about 140 cities. The averages for each category of cities are unweighted averages. This helps in testing the statistical significance of the differences between the means wherever necessary.

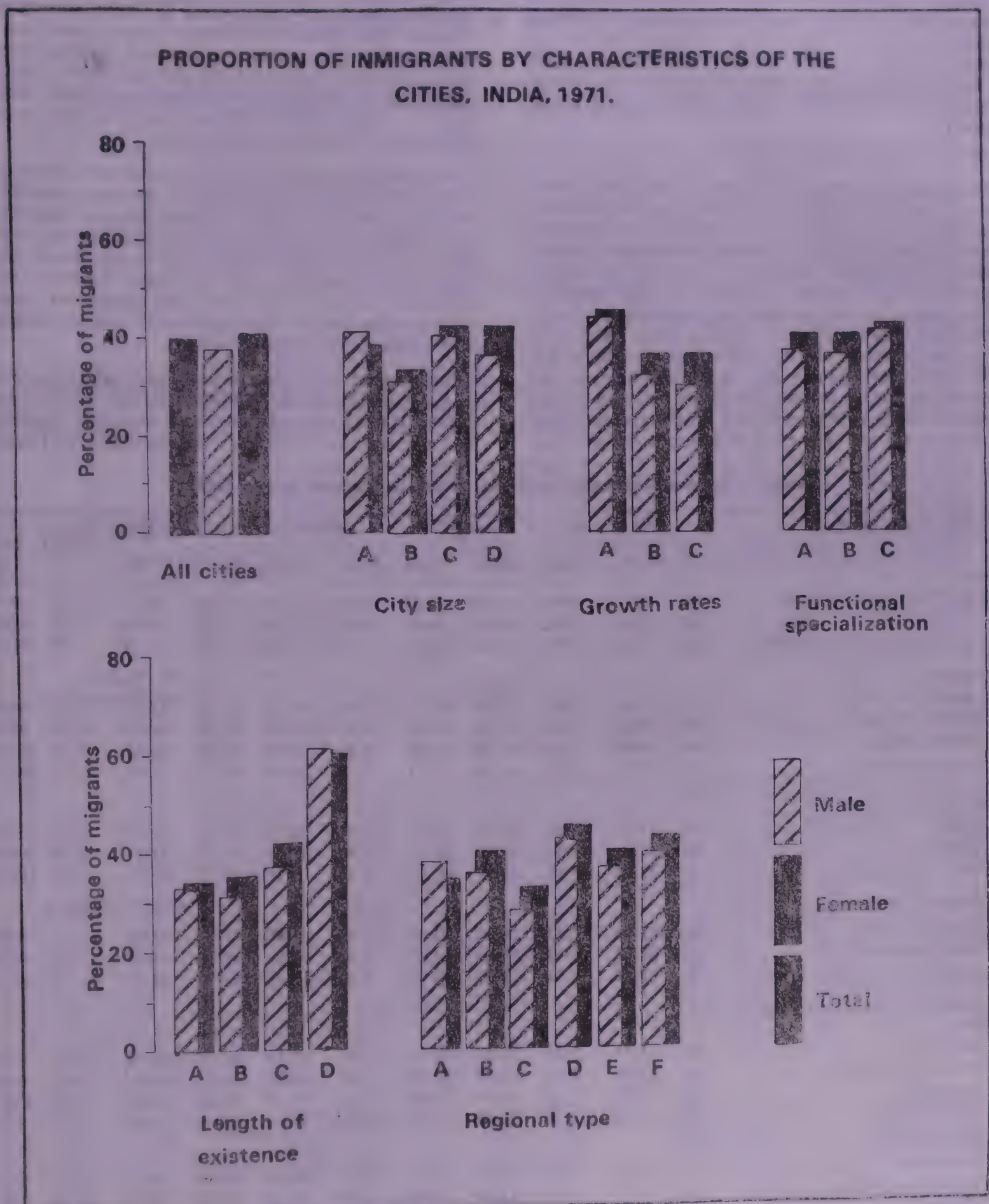
Pattern of Migration to Cities in India

Lifetime Migrants to Class I cities in India constitute about two-fifths of their population, the proportion being somewhat higher among females than males (Table 2). The proportion of migrants was significantly lower in cities in 500,000—999,999 population size category in comparison to other cities although half of them had fast growth rates and the other half medium growth rates during 1951-71. Besides natural increase, accretion of peripheral areas through expansion of municipal boundaries seems to be a major cause of high growth rates of these cities rather than inmigration.

Table 2 : Proportion of total, male and female migrants by characteristics of the cities, 1971

Characteristics of the cities	N	Total	Males	Females
All Cities	140	39.13	37.64	40.75
A. *City Size*:				
1. Million plus Cities	8	39.77	41.13	38.05
2. 500,000—999,999	10	32.13	31.31	33.09
3. 200,000—499,999	51	40.98	40.20	41.77
4. 100,000—199,999	71	38.72	36.30	41.41
B. *Growth Rates*				
1. High	64	45.27	44.76	45.75
2. Medium	50	34.15	32.03	36.54
3. Low	24	33.21	30.32	36.42
C. *Functional Specialization*				
1. Manufacturing	65	38.80	37.16	40.62
2. Trade & Transport	55	38.46	36.83	40.19
3. Service	20	42.05	41.41	42.77
D. *Length of existence as Class I Cities*				
1. Before 1901	24	33.34	33.30	33.36
2. Between 1901 and 1951	21	33.06	31.08	35.31
3. Since 1951	84	39.83	37.84	42.01
4. New Cities	10	60.61	61.10	59.92
E. *Regional Type*				
1. Himalayan	6	36.87	38.29	34.96
2. Upper Ganga plains	24	38.00	35.96	40.41
3. Mid. & Lower Ganga plains	19	30.20	28.22	32.54
4. Central plateau	27	44.29	42.95	45.77
5. Deccan plateau	35	38.88	37.58	40.30
6. Coastal plains	29	41.88	40.20	43.51

Figure--1


PROPORTION OF INMIGRANTS BY CHARACTERISTICS OF THE CITIES, INDIA, 1971.
Percentage of migrants
80
60
40
20
0
All cities
A B C D
City size
A B C
Growth rates
A B C
Functional specialization
A B C D
Length of existence
A B C D E F
Regional type
Male
Female
Total

As one would expect, cities with high growth rates had a higher proportion of migrant population than other cities (Figure 1). Service cities as well as the comparatively new cities, had a much higher proportion of inmigrants than other cities. The proportion of migrants to cities of middle and lower Ganga plains was just 30.2 per cent compared to cities of central plateau (44.3 per cent) or cities in the coastal plains (Figure 1).

The sex ratio among the lifetime migrants was favourable to females for most categories of cities; however, it was in favour of males in the million plus cities, in cities which had come into existence comparatively more recently, and in those belonging to north and north-eastern Himalayan region. (Figure 1). The problem of living space in the metropolises probably acts as a deterrent to female migration which keeps their proportion low in them. In the new cities, the initial job opportunities were largely for males which made the sex ratio high but the reasons for a high sex ratio among migrants to cities in the north and north-eastern Himalayan region are not very clear and need some probing.

Table 3 gives the distribution of migrants by their place of origin. As the table is based on "place of last residence", many of those persons who were born outside India but, after coming to India, subsequently changed their place of residence were counted as migrants within the country; in contrast, persons born in India but who returned from abroad before the 1971 census were enumerated with last residence "outside India". Hence, this Table may not provide an exact quantum of immigrants to the cities.

Inmigrants to the cities from rural and urban areas constituted 53.3 per cent and 40.8 per cent respectively, the rest coming from other countries. In relation to the population of sending areas, however the proportion of urban migrants to the cities was much higher than rural migrants. A significant share of urban migration seems to be turn-round migration among class I cities but its quantum could not be estimated in the absence of city-by-city flows.

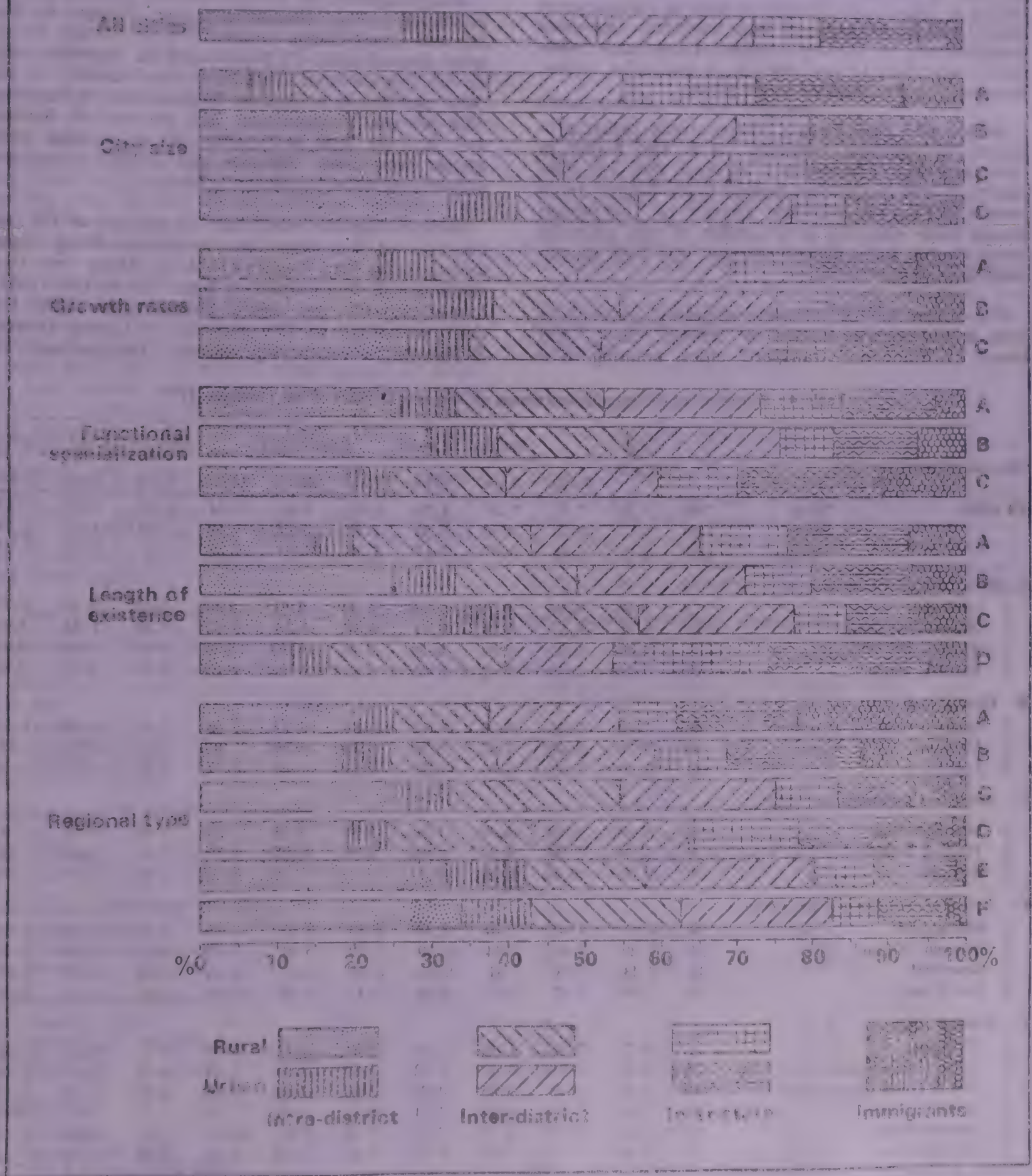
Intradistrict migration (rural and urban) accounted for one-third of the lifetime migrants whereas interdistrict (intrastate and interstate migrants) constituted 38.3 per cent and 21.9 per cent respectively (Table 3).

Table 3 : Distribution of inmigrants to cities in different migration streams, 1971

Characteristics of the Cities		Intradistrict		Interdistrict		Interstate		Resided in India		Immigrants	Total
	N	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban		
All Cities . . . Total	146	26.48	7.48	17.84	20.45	8.99	12.88	53.31	40.81	5.87	99.99
Male	146	25.41	7.02	18.57	20.03	9.91	12.95	53.89	40.00	6.11	100.00
Female	146	27.59	7.95	17.09	20.98	7.88	12.81	52.56	41.74	5.70	100.00
A. *City Size*:											
1. 1,000,000+	9	6.36	5.08	25.41	17.75	17.15	19.96	48.92	42.79	8.22	99.93
2. 500,000—999,999 . . .	10	19.65	5.51	21.04	23.67	9.42	15.38	50.11	44.56	5.32	99.99
3. 200,000—499,999 . . .	54	23.41	6.74	17.44	21.28	10.01	14.02	50.86	42.04	7.11	100.01
4. 100,000—199,999 . . .	73	32.17	8.58	16.78	19.73	7.16	10.83	56.11	39.14	4.75	100.00
B. *Growth Rates*:											
1. High	68	23.63	6.67	19.04	19.85	10.76	14.48	53.43	41.00	5.56	99.99
2. Medium	50	30.16	8.30	16.31	21.11	6.49	11.16	52.96	40.57	6.45	99.99
3. Low	26	26.75	7.98	17.17	21.88	8.80	11.85	52.72	41.71	5.58	100.01
C. *Functional Specialization* :											
1. Manufacturing . . .	68	25.96	6.87	19.46	20.34	10.41	12.69	55.83	39.90	4.26	99.99
2. Trade & transport . .	57	29.63	9.13	16.86	20.67	6.98	10.91	53.47	40.71	5.81	99.99
3. Service	21	19.62	4.94	15.29	20.23	9.80	18.86	44.71	44.03	11.26	100.00
D. *Length of existence as a Class I City* :											
1. Before 1901	25	14.71	5.04	23.07	21.81	11.50	16.10	49.28	42.95	7.75	99.98
2. Between 1901 & 1951 . .	24	25.31	7.89	15.79	22.22	8.49	13.38	49.62	43.49	6.88	99.99
3. Since 1951	86	31.99	8.49	16.49	20.53	6.68	10.47	55.26	39.49	5.25	100.00
4. New-City	10	12.06	4.53	23.08	13.91	20.64	21.57	55.78	40.01	4.20	99.99
E. *Regional Type* :											
1. Himalayan	6	19.92	5.14	12.34	16.81	8.57	14.76	40.83	36.71	22.45	99.99
2. Upper Ganga plains . .	24	18.53	6.07	13.90	20.46	8.75	18.15	41.18	44.68	14.15	100.01
3. Mid & Lower Ganga plains .	20	25.12	6.81	22.69	20.44	7.95	9.08	55.76	36.33	7.92	100.01
4. Central plateau	27	18.98	5.09	18.95	20.26	14.49	17.67	52.42	43.02	4.54	99.98
5. Deccan plateau . . .	35	32.02	9.77	16.22	21.74	8.22	11.18	56.46	42.69	0.85	100.00
6. Coastal plains . . .	34	34.30	8.80	19.54	19.93	6.26	9.03	60.10	37.76	2.13	99.99

Figure 2

DISTRIBUTION OF IMMIGRANTS IN DIFFERENT MIGRATION STREAMS BY CHARACTERISTICS OF THE CITIES, INDIA, 1971.



The proportion of intradistrict migration was lowest in the million plus cities (Figure 2) owing to the fact that Bombay, Calcutta and Madras form districts in themselves and, hence, they did not have intradistrict migrants. Intradistrict migration was more than 50 per cent in 29 cities all of which (except four which belong to Bihar) are situated in Deccan plateau or in coastal plains, and some of them have been important manufacturing or trading centres. Large scale intradistict migration to the cities in a particular region, however, requires detailed investigation.

Million plus cities have a comparatively higher proportion of interstate migrants. It is also higher in cities with high growth rates, in those that are comparatively new or the ones located in the Central India plateau. There is a certain amount of interaction among these variables as a number of new cities lie in the Central India plateau and had very high growth rates during 1951-71.

The proportion of interstate migrants, particularly from urban areas, is highest in "service" cities, and lowest in "trade and transport" cities, pointing to a greater pull of service cities on long-distance migrants. The reasons associated with the quantum of intradistrict, interdistrict, and interstate migration to the various cities in India, however, have to be examined in detail.

The proportion of immigrants was highest in cities belonging to the Himalayan region followed by Punjab and upper Ganga plains. The proportion was almost three-fourths (72.2 per cent) in Agartala (capital of Tripura which borders Bangladesh). It was 35.0 per cent in Jullundur; 33.3 per cent in Burdwan; 32.4 per cent in Amritsar; 32.3 per cent in Rohtak; and 32.2 per cent in Calcutta. Most of these immigrants came from Pakistan and present Bangladesh after the partition of country in 1947.

Current migrants[6] constitute 7.2 per cent of the total migrants to the cities, the proportion being higher among males than females (Table 4). There were large variations in this proportion from city to city from a low of only 0.84 per cent in Shahjahanpur (Uttar Pradesh) to a high of 19.5 per cent in Jammu (Jammu & Kashmir) for varying reasons. For instance the

Table 4 : Percentage of current migrants among all migrants by place of last residence, 1971

Characteristics of the City	N	Total migrants	Resided in India			Intradistrict			Interdistrict and interstate		
			Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
All Cities . . . Total .	140	7.24	7.61	7.22	8.29	6.62	6.01	8.34	8.58	9.06	8.39
Males .	140	8.33	8.78	8.40	9.50	7.82	7.22	9.68	9.69	10.06	9.54
Females .	140	6.11	6.41	5.97	7.11	5.54	4.90	7.22	7.37	7.72	7.24
A. *City Size*											
1. 1,000,000	8	5.86	6.06	5.78	6.38	6.44	5.31	8.97	6.66	6.79	6.67
2. 500,000—999,999+ . .	10	6.31	6.57	6.11	7.11	4.58	4.24	5.52	7.30	7.74	7.16
3. 200,000—499,999 . . .	51	7.61	8.07	7.81	8.59	6.76	6.30	8.12	9.03	9.63	8.76
4. 100,000—199,999 . . .	71	7.25	7.59	7.12	8.46	6.83	6.10	8.83	8.60	9.03	8.45
B. *Growth Rate*											
1. High	64	7.10	7.45	6.93	8.16	6.88	6.23	8.68	8.16	8.42	8.12
2. Medium	50	7.70	8.08	7.67	8.90	6.38	5.98	7.82	9.65	10.26	9.40
3. Low	24	6.59	7.02	6.96	7.51	6.53	5.52	8.72	7.37	8.10	7.10
C. *Functional Specialization*											
1. Manufacturing . . .	65	6.64	6.88	6.49	7.54	5.96	5.34	7.64	7.86	8.39	7.60
2. Trade & Transport . .	55	7.06	7.34	6.90	8.16	6.98	6.22	9.19	8.19	8.47	8.16
3. Services	20	9.66	10.68	10.50	11.11	7.79	7.56	8.27	11.96	12.82	11.56
D. *Length of existence as Class I City*											
1. Before 1901 . . .	24	6.91	7.30	7.10	7.54	5.85	5.35	7.39	8.27	9.03	7.84
2. Between 1901 and 1951 . .	21	7.29	7.89	7.44	8.59	7.19	6.01	9.40	8.47	8.96	8.35
3. Since 1951 . . .	84	7.43	7.78	7.31	8.65	6.61	6.11	8.16	9.01	9.45	8.83
4. New Cities . . .	10	6.34	6.42	6.46	6.65	7.13	6.40	9.00	6.20	6.34	6.26
E. *Regional Type*											
1. Himalayan . . .	6	10.72	12.63	11.89	12.63	9.24	9.51	8.59	14.31	14.94	13.48
2. Upper Ganga plains . .	24	8.75	9.91	10.42	9.72	7.59	7.33	8.34	10.88	12.67	9.94
3. Mid & Lower Ganga plains .	19	3.57	3.73	3.45	4.29	2.87	2.85	3.10	4.32	4.04	4.64
4. Central plateau . . .	27	7.05	7.22	6.92	7.71	6.12	5.81	7.26	7.76	7.98	7.77
5. Deccan plateau . . .	35	7.06	7.10	6.34	8.15	7.08	5.41	10.99	7.81	8.68	7.40
6. Coastal plains . . .	29	8.05	8.17	7.43	9.55	7.73	7.24	9.61	10.10	9.66	10.44

*Current migrants are those who moved to the city within one year of census enumeration in contrast to lifetime migrants who came to the city at some point during their life and have been living there since then.

high proportion of current migrants (16.4 per cent) in Meerut (Uttar Pradesh) was probably due to the counting of those people as migrants who had come to an annual fair which attracts thousands of shopkeepers and others for three to four weeks from different parts of the country as this fair was being held at the time of 1971 census enumeration.

Proportion of current migrants among the total migrants from other urban areas of the same district was significantly higher than those from rural areas of the district. In contrast, the proportion of current migrants among total migrants from rural areas in the combined interdistrict and interstate stream was higher than current migrants from urban areas in this stream implying that the pull of the cities on medium and long distance migrants from rural areas was greater than on similar urban migrants during 1970-71.

The proportion of current migrants in the million plus cities was somewhat lower than other size categories although the differences are not statistically significant. The proportion of current migrants was higher in cities with medium growth rates instead of cities with high growth rates; it was significantly higher in service cities, and in cities located in the Himalayan region or in Punjab and Upper Ganga plains The cities of the middle and Lower Ganga plains had significantly low proportion (3.6 per cent) of current migrants (Figure 3 and Table 4). These cities had a much smaller proportion of lifetime migrants (Figure 1), and most of them had medium to low growth rates. These facts point toward the stagnation of the cities of this region.

It is noteworthy that whereas the comparatively new cities had the highest proportion of lifetime migrants, the proportion of current migrants among them was the lowest although the difference was not statistically significant. This may probably be because one phase of development of these new cities was over and unless they get new investments, their attractive power would be limited.

Characteristics of the Migrants

After discussing the pattern of immigration to the cities in terms of total lifetime migrants and in different migration streams, and current migrants among total migrants, I shall now ananlyse some of the important characteristics of the inmigrants. A comparison of the characteristics of the migrants and non-migrants will also be made to the extent data are amenable. The characteristics that will be covered in this paper are sex and age composition of the migrants and the non-migrants, educational attainment, and pattern of employment.

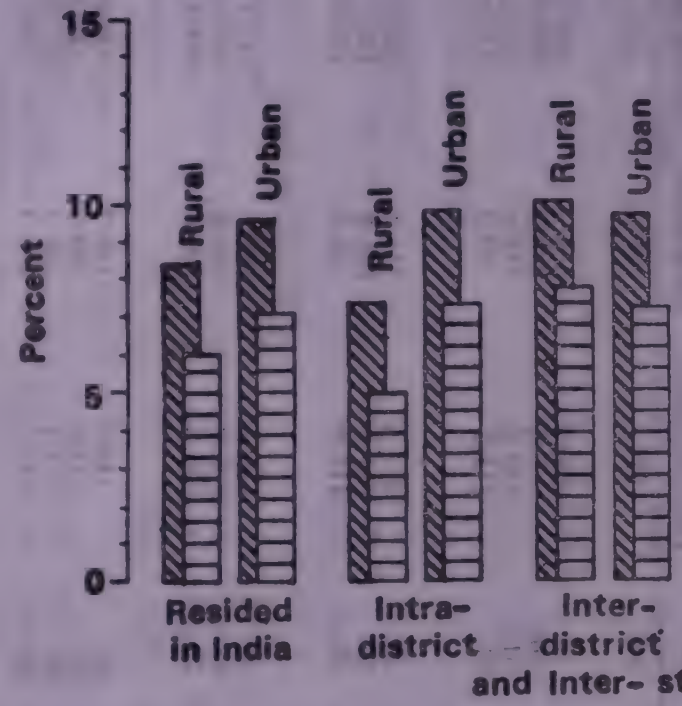
Sex-Composition

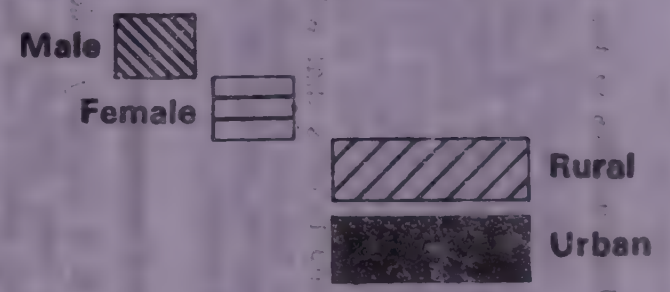
It is generally believed that urbanward migration in India particularly to cities and metropolises, is male selective and leads to an imbalance in the sex ratio (a higher sex ratio in urban population than in total). The 1971 census for the 140 cities, however, show that the sex ratio among the lifetime migrants to them was lower than that of the total population, and more so, as compared to non-migrants (Table 5). The

Table 5 : Sex ratio in the total population among all migrants and current migrants by different characteristics of the cities, 1971

Characteristics of the Cities	N	Total population	All migrants	Current migrant
All Cities	140	115.6	107.0	145.6
A City Size				
1. 1,000,000+	8	120.8	131.2	148.3
2. 500,000—999,999	10	117.1	110.8	159.9
3. 200,000—499,999	51	117.8	113.6	150.6
4. 100,000—199,999	71	113.2	99.0	139.8
B. *Growth Rate*				
1. High	64	117.5	115.1	142.9
2. Medium	50	114.0	101.6	144.3
3. Low	24	112.9	94.4	151.0
C. *Functional Specializaion*				
1. Manufacturing	65	115.4	105.9	147.8
2. Trade & Transport	55	114.0	105.0	138.2
3. Service	20	120.7	116.0	159.1
D. *Length of existence of Class I City*				
1. Prior to 1901	24	118·7	119·7	158·8
2. Between 1901 and 1951	21	113·9	99·8	148·4
3. Since 1951	84	113·4	102·3	141·2
4. New cities	10	131·3	133·7	150·0
E. *Regional Type*				
1. Himalayan	6	119·7	135·1	180·5
2. Upper Ganga plains	24	119·2	107·2	148·9
3. Mid & Lower Ganga plains	19	123·4	106·4	166·0
4. Central plateau	27	119·2	111·4	150·5
5. Deccan plateau	35	111·1	104·0	140· 7
6. Coastal plains	29	108·8	101·0	123·8

PERCENTAGE OF CURRENT MIGRANTS TO ALL MIGRANTS BY CHARACTERISTICS OF THE CITIES, INDIA, 1971.





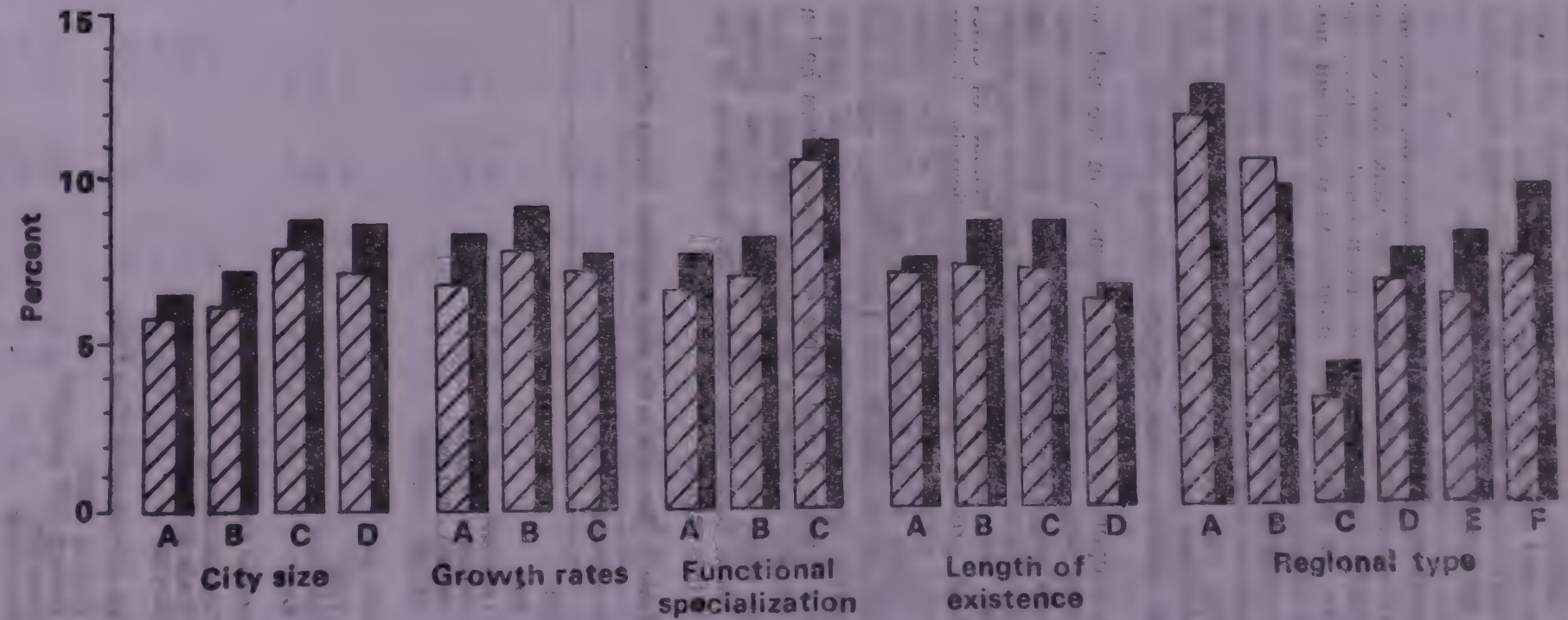
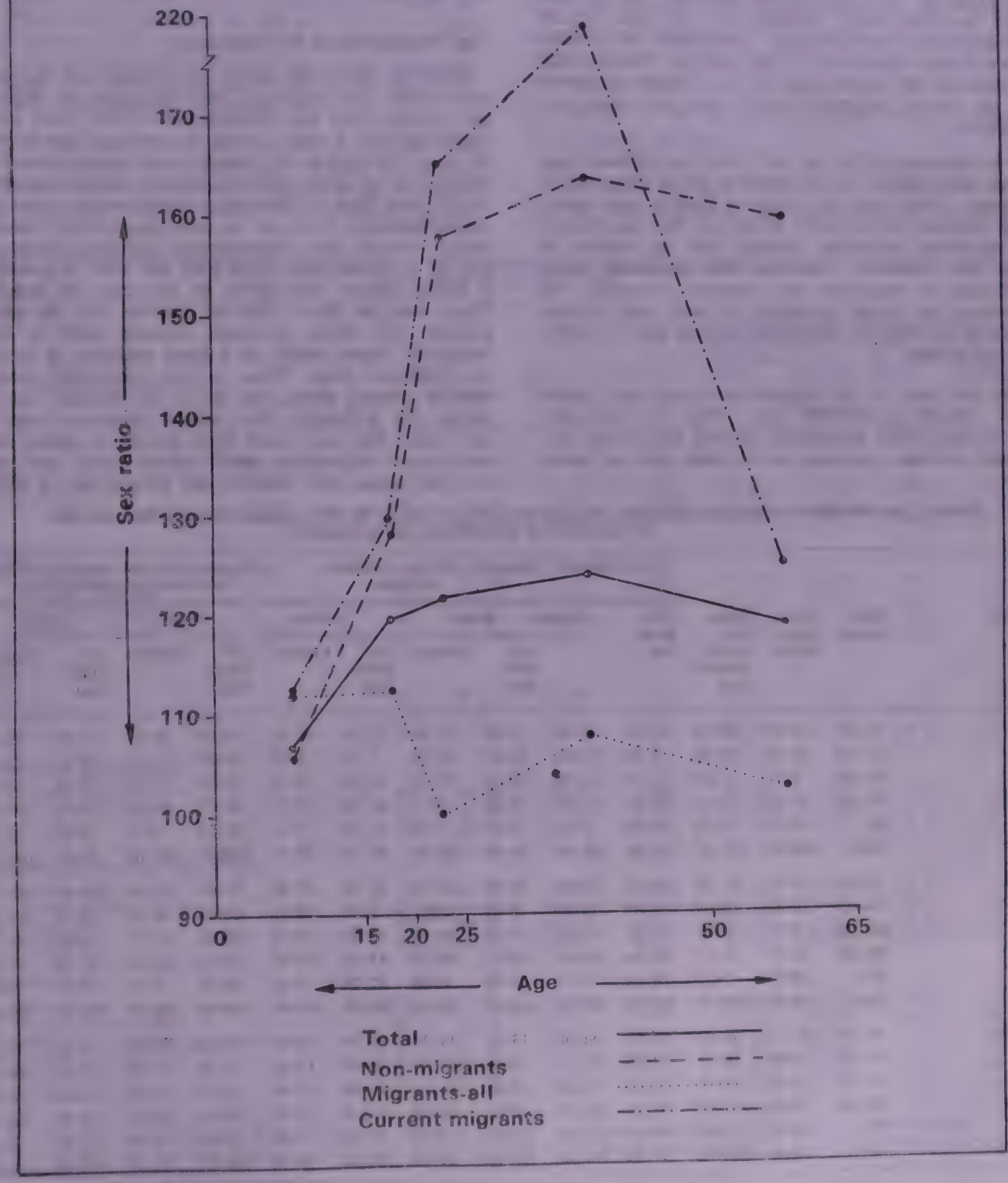


Figure —4

SEX RATIO BY AGE IN THE TOTAL POPULATION, NON-MIGRANTS AND MIGRANTS TO CITIES, INDIA, 1971.



sex ratio of the current migrants, however, was higher (145.7) as against 106.9 for all migrants and 121.1 for the non-migrants. Mitra (1967) had observed that the sex ratio, although above 100, became somewhat favourable to females with longer duration of residence. Two factors seem to explain the above pattern: (1) the sex ratio of the non-migrant population increases with increasing age upto group 25-49 indicating marriage migration of females from the cities, and (2) in contrast the sex ratio of the migrants aged 20 and above becomes lower precisely for the same reason and owing to "associational movement of females (Table 5 and Figure 4)". The opposite trend in the sex ratio in the young ages of the lifetime migrants and the current migrants is not clear and needs examination.

It is noteworthy that the sex ratios for different age groups were higher for the rural migrants than urban migrants. There was an excess of females over males in all duration intradistrict migration but interdistrict and interstate migration streams had the excess of males over females. Detailed data including those on causes of migration are, however, required to determine the exact quantum of male and female selectivity in different migration streams and in different age groups.

The sex ratio of the migrants to cities with population 100,000 to 199,999 was 99.0. It was only 94.4 in cities with population growth rate below the national average, pointing to a weak pull of these cities.

Sex ratio in the million plus cities, new cities, or those situated in the Himalayan region was higher than that of their total population but the reverse was true for cities falling in other categories. The high sex ratio in the total and migrant populations of the cities in the Himalayan region is most probably because three out of six have military cantonments. In the new cities, the high sex ratio, seems to have resulted from migration mainly for economic reasons.

Age Distribution of the Migrants

Table 6 gives the mean proportions of the total population, non-migrants, and migrants in different age groups. The age distribution of the total population of class I cities seems to conform largely with the age distribution of country's total population. The proportion of male children (below 15) is somewhat lower than that of females; consequently males are proportionately more in the age group 25-49 than females. Among the non-migrants, children below the age of 15 form more than half the total population; it being almost three-fifths in the case of females. There can be three different reasons for the above pattern: (1) After marriage, females shift to their husbands' home which, in a large majority, is located in a different place. Thus, a very substantial proportion of women above the age of 20 become out migrants. (2) Although cities attract migrants from far and wide, they also send their people to other cities (turn-round migration), small urban areas, and even to rural areas, this reduces the proportion of young

Table 6 : Age distribution of the total population, non-migrants, and migrants to the cities, migrants being further classified by their place of last residence and by duration

Sex	Age group	Total population	Non-migrant population	Total migrants All duration	Total migrants Current	Migrants with last residence in India: Rural All duration	Migrants with last residence in India: Rural Current	Migrants with last residence in India: Urban All duration	Migrants with last residence in India: Urban Current	Migrants with last residence within the district of enumeration: Rural All duration	Migrants with last residence within the district of enumeration: Rural Current	Migrants with last residence within the district of enumeration: Urban All duration	Migrants with last residence within the district of enumeration: Urban Current
Total	0—14	39·47	54·78	17·49	29·61	15·88	27·89	21·50	32·17	16·09	29·84	21.76	35·27
	15—19	10·19	10·52	9·56	14.08	10.07	17·59	9.75	11·29	10·37	15·31	10·34	12.49
	20—24	9·77	7.63	12·79	16·80	13.35	17·53	12·89	16·09	12·45	15·27	12·45	14·67
	25—49	30·28	19·82	45·36	31·86	45·52	30·2	43.35	33·33	44·77	30·55	42.51	30·60
	50	10·29	7.26	14·80	7·65	15·17	7·78	12·50	7·11	16·33	90·3	12·93	6·97
	Total	100·00	100.01	100·00	100·00	99·99	100·01	99·99	99·99	100h01	100·00	99·99	100·00
Males	0—14	38·11	51·50	18·12	26·64	16·54	25·05	22.41	29·40	17·61	26·78	23·62	32·74
	15—19	10·34	10.68	9.75	12·84	10.69	15h61	9·42	9·59	11·04	14·15	9·74	10·27
	20—24	9·99	8·38	12·31	16·98	13.16	18·18	11·87	15·55	12·05	16·27	11·38	13·79
	25—49	31·17	21·71	45.24	36·42	45·13	34·27	43·52	38·63	43·73	34.56	41·99	36·12
	50+	10·38	7·73	14.58	7·12	14.48	6·88	12·79	6·84	15·57	8.24	3·27	7·07
	Total	99·99	100·00	100·00	100·00	100·00	99·99	100·01	100.01	100·00	100·00	100·00	99·99
Females	0—14	41.14	58·89	17·09	34.58	15.47	33.26	20.94	36·56	14·88	35·50	20·27	37·19
	15—19	10·00	10·31	9.36	15.34	9·42	17·29	10·09	13·42	9·70	16·86	10·86	16·02
	20—24	9.51	6·70	13.25	16·28	13.49	14.94	13.84	16·68	12·74	13·46	13·34	15·58
	25—49	29·18	17·47	45.24	25.49	45·68	24·58	438·9	25·79	45·64	24·33	42·84	24·23
	50+	10·17	6·63	15·05	8·31	15·94	8·92	12.24	7·54	17·04	9·84	12·69	6·98
	Total	100·00	100·00	99·99	100·00	100·00	99·99	100·00	99·99	100·00	99·99	100·00	100·00

workers in the non-migrant population. (3) New cities having a comparatively high proportion of migrant population have very little of original residents above the age of 20, but children born to the migrants over the years are non-migrants and this raises the proportion of 0-14 years old among the non-migrant population. In contrast, there being limited family migration, the proportion of children below 15 among the migrants remains quite small (col. 5 of Table 6). Moreover, in case of family migration, children who were below 15 at the time of migration, many of them would have crossed the age of 15 by the time of the census. This aspect becomes clear from col. 6 which gives the age distribution of the current migrants, the figure for 0-14 age group being much higher in them than "all duration" migrants.

Young migrants (below the age of 15) to cities from urban areas constitute a significantly higher proportion than those from rural areas probably owing to higher family migration from them. This tendency seems to be more prevalent among intra-district (or short distance) migrants.

Literacy and Educational Attainment

Various surveys conducted in India and in other countries have established that the migrants possess higher educational qualifications than their brethren in the places of origin but somewhat lower qualifications than the non-migrants at destinations. This section presents a comparison of (1) literacy rate[7] of the non-migrants and the migrants by migration streams and by characteristics of the cities, and (2) educational attainment of the migrants, migrant workers, and of non-migrant workers.

Literacy Rates—Table 7 gives the literacy rates of the non-migrants and the migrants by charac-

Table 7: Literacy rates of the non-migrants, migrants— migrants being further classified by migration streams—and migrant workers by characteristics of the cities, 1971

Characteristics of the Cities		N	Non-migrants	Total migrants	Total	Migrants with last residence in India			
						Elsewhere in the district	In other districts of the same State	In other States	Migrant workers
1		2	3	4	5	6	7	8	9
All Cities	Total	147	48·23	61·57	61·27	54·25	66·24	66·13	71·81
	Males	147	55·35	74·34	73·89	71·28	76·72	74·35	71·71
	Females	147	39·63	48·46	48·40	38·57	55·22	56·45	41·71
A. *City Size*									
1. 1,000,000+		9	54·76	64·31	62·82	57·54	64·83	65·71	72·29
2. 500,000—999,999		10	48·25	62·51	62·06	46·70	66·36	71·52	73·54
3. 200,000—499,999		54	48·75	62·88	62·64	54·22	67·47	67·66	72·50
4. 100,000—199,999		74	47·05	60·15	59·98	55·03	65·50	64·33	71·02
B. *Growth Rate*									
1. High		68	49·00	62·68	62·42	56·61	66·75	64·71	71·77
2. Medium		51	47·65	61·14	60·73	51·86	66·24	68·06	71·68
3. Low		26	48·11	60·13	59·95	54·06	65·13	66·42	72·87
C. *Functional Specialization*									
1. Manufacturing		68	48·09	60·10	59·81	52·97	64·31	65·08	70·58
2. Trade & Transport		58	48·48	62·31	61·93	56·33	67·36	65·78	72·09
3. Services		21	48·02	64·28	64·22	52·78	69·74	70·45	75·03
D. *Length of existence as Class I City*									
1. Before 1901		25	49·91	62·74	61·93	50·28	64·92	68·67	72·74
2. Between 1901 & 1951		24	49·21	62·57	62·46	53·64	69·13	69·13	73·30
3. Since 1951		87	48·63	60·90	60·74	56·06	65·73	65·21	71·16
4. New cities		10	37·73	61·83	61·33	49·03	65·23	60·94	71·06
E. *Regional Type*									
1. Himalayan		6	51·30	63·51	63·80	55·52	70·42	69·01	70·37
2. Upper Ganga plains		24	44·45	58·14	57·70	48·60	60·91	65·09	70·86
3. Middle & Lower Ganga plains		21	43·30	59·07	58·10	47·94	66·59	67·15	71·36
4. Central plateau		27	46·27	61·01	60·64	49·68	63·84	64·75	71·28
5. Deccan plateau		35	49·25	61·02	60·97	56·89	66·72	63·44	70·61
6. Coastal plains		34	53·90	66·20	66·13	63·15	70·16	69·57	74·66

The definition of literacy in the Indian Census is "ability to read and write simple letters in any language with understanding". The literacy rate is computed by taking the total population in the denominator as the detailed age composition of the literates and total population of each city is not available.

teristics of the cities, migrants being further classified by various migration streams. The rates of the migrants are much higher than those of the non-migrants probably because of the variations in the age composition of the two sub-populations. The difference is much greater in case of males than females. Literacy rates of intra-district migrants are consistently lower than of inter-district or interstate migrants in all categories of cities. This probably implies that illiterate migrants travel short distances because (1) they are generally poor and do not possess enough resources to go to far off places, and (2) they do not get information and knowledge about job opportunities at far off places as much as others get.

Further, the literacy rates of migrant workers are higher than the total migrants in all categories of cities which is quite understandable. It is, however, noteworthy that the literacy rate of female migrant workers are lower than all female migrants. This means that a majority of literate and educated female migrants are in the cities due to marriage or associational migration and do not take up jobs after moving to the cities.

Although the literacy rate of the total migrants to the million plus cities is higher than migrants to other cities, the difference becomes statistically significant only between the highest and the lowest city-size classes. Similarly, the literacy rate of the migrants to "service" cities is significantly higher than migrants to "manufacturing" cities but not from "trade and transport" cities. Further, migrants to the cities of the Indo-Gangetic plains are with significantly lower literacy rates than migrants to the cities in coastal plains.

Educational Attainment.—Table 8 gives the distribution of migrants of each sex in different migration streams by level of educational attainment. As one would expect, the proportion of females with matriculation and higher levels of educational attainment is significantly lower than males in all the migration streams. Further, the proportion of intra-district migrants is consistently lower than inter-district and interstate migrants for all educational levels; the differences, however, become significant only with at least middle level (VIII grade) education. No differences are observed in the educational attainment of the inter-district and interstate migrants.

Educational Attainment of the Non-migrant and Migrant Workers.—On the basis of certain studies conducted earlier, it was stated that the educational attainment of the migrant workers is generally lower than that of non-migrant workers. I wanted to test this hypothesis on the basis of data for all the 147 cities. However, whereas census data on educational attainment of migrant workers in each city are available even by occupational divisons, no such data are available for the total population of each urban agglomeration/city or for non-migrant population. Fortunately, these data are available from census publications for the urban population of each district.

Table 8 : Distribution of migrants of each sex by educational attainment in different migration streams and of migrant workers, 1971

(Percentages)

Migration Stream	N	Sex	Level of Educational Attainment						
			Illiterate	Literate without formal education	Upto primary level	Above primary but upto middle	Matriculate & diploma holders	Graduate and above	Total
Total migrants	147	T	38.43	12.59	15.27	13.03	16.09	4.59	100.00
	147	M	25.66	13.17	15.89	15.28	22.95	7.05	100.00
	147	F	51.54	12.06	14.70	10.75	8.95	2.00	100.00
With last residence in India	147	T	38.73	12.60	15.13	12.93	15.99	4.62	100.00
	147	M	26.11	13.18	15.72	15.11	22.77	7.12	100.01
	147	F	51.60	12.06	14.59	10.74	9.00	2.02	100.01
Last residence elsewhere in the district of enumeration	144	T	45.75	12.34	14.63	11.66	12.75	2.87	100.00
	144	M	28.72	13.73	16.20	15.45	20.77	5.12	99.99
	144	F	61.43	11.16	13.24	8.19	5.22	0.77	100.01
Last residence in other districts of the State	145	T	33.76	12.78	15.18	13.92	18.38	5.99	100.01
	145	M	23.28	12.75	14.71	14.82	25.25	9.22	100.03
	145	F	44.78	12.90	15.71	13.01	11.06	2.54	100.00
Last residence in other States/U.Ts.	147	T	33.87	13.03	15.75	13.99	18.06	5.30	100.00
	147	M	25.65	13.42	16.20	15.02	22.59	7.12	100.00
	147	F	43.55	12.62	15.22	12.59	12.79	3.23	100.00
Migrant workers	147	T	28.19	10.48	15.52	14.42	22.75	8.64	100.00
	147	M	24.27	11.19	16.89	15.52	23.41	8.72	100 00
	147	F	58.29	4.41	4.90	5.44	17.55	9.42	100.01

I therefore selected 17 such districts where the population of the main city constituted more than 85 percent of the total urban population of the districts. I assumed that the urban population of these districts represented the characteristics of the total urban population of the cities lying in them and, hence, the difference between the urban population of the district and the migrant population of the city reflected the characteristics of the non-migrants. Among these 17 cities, some are million plus, some fall in the half-a-million to one million range and some are below half-million population size they represent different functional specializations and are located in different regions. Table 9 gives the distribution of male and female migrant and non-migrant workers by their educational attainment for 17 cities put together. The data clearly reflect that the proportion of illiterates is significantly higher among the non-migrant male workers than migrant male worker. In contrast the proportions of (1) matriculates and diploma holders, and (2) graduates and above are much higher among the migrant male workers than non-migrants. A similar pattern is observed in the case of female workers. These data clearly establish the superiority in educational attainment of the migrant workers over the non-migrant workers. They also imply that migrants to the cities in India largely come because of better job opportunities and the pull of the cities rather than push from rural areas. It is noteworthy here that the male non-migrant workers in Greater Bombay, Poona, Nagpur, Ahmedabad, and Indore, have somewhat higher levels of educational attainment than their migrant counterparts.

Work Participation Rates of the Migrants and the Non-migrants

As male migration to cities is largely for economic reasons, one expects a higher work participation rates of male migrants in all age groups than non-migrants. In contrast, as female migration is largely due to marriage or for accompanying the principal bread-winner, their work participation rates are expected lower than of non-migrant. Table 10 presents the work participation rates of migrant and non-migrant males and females for the total and for 15-29 and 30-59 age groups respectively. The work participation rates of migrant males are almost double those of non-migrants. Similarly, work participation rates of migrant females are about one-and-a-half times those of non-migrant females. There are variations in the work participation rates by the characteristics of the cities. For example, it is significantly higher in million plus cities as compared to that of cities in other size categories. It is significantly higher in cities with high growth rates, higher in the cities with very long standing (established prior to 1901) or in new cities, and higher in cities of Himalayan region or of Punjab and Upper Ganga plains. In contrast, the work participation rates of non-migrant males do not differ significantly by city size-class, but is significantly lower for cities with high growth rates. It is also low in the "service" cities, or that are comparatively new, or in the cities that are situated in the Himalayan region.

Work participation rates of migrant males aged 15-29 are significantly higher than those of non-migrants in this age group but the rates for the age gorup 30-59 are almost the same since every able-bodied man in this age group is expected to be engaged in some economic activity. It is noteworthy that the participation rate of migrant males aged 15-29 is highest in million plus cities but it is lowest of the non-migrant males, the difference being highly significant. The higher participation of migrant males in this age group is probably due to the fact that (1) most migration is for jobs and very little for educational purposes, and (2) non-migrants continue to pursue higher education and, many a times, wait for job commensurate with their educational qualification or family status.

It is interesting to note that whereas the work participation rate of all migrant females is significantly higher than non-migrant females, in contrast, it is significantly higher of non-migrant females in the age-group 30-59, and almost same in the age group 15-29. This anomaly arises probably due to higher participation rate of female migrants below the age of 15 as well as above the age of 60. The reasons for this seem to be both economic and sociological and need careful examination according to the different categories of the cities.

Industrial classification of workers in Total Population.—Non-Migrants and Migrants.—The industrial classification of the workers reflects the economic structure of the working population. The differences in the placement of the non-migrant and the migrant workers, particularly when migrants are classified by

Table 9 : Educational attainment of the migrant and non-migrant workers by sex (average for 17 cities), 1971

Level of educational attainment	Migrant Workers		Non-migrant Workers	
	Males	Females	Males	Females
Illiterate	25.03	50.59	33.67	56.59
Literate without formal education	11.29	3.73	12.90	5.09
Upto primary level	14.76	3.95	16.99	4.82
Above primary but upto middle	13.31	5.25	13.85	5.30
Matriculates and diploma holders	25.23	22.21	17.60	17.95
Graduate and above	10.38	14.27	4.99	10.25
Total	100.00	100.00	100.00	100.00

Table 10 : Work participation rates of the migrants and the non-migrants of each sex and in selected age groups by characteristics of the cities, 1971

Characteristics of the Cities	N	Migrants						Non-migrants					
		Males			Females			Males			Females		
		Total	15—29	30—59	Total	15—29	30—59	Total	15—29	30—59	Total	15—29	30—59
All Cities	147	64.17	61.91	93.52	7.88	7.72	11.36	36.13	55.53	92.85	4.81	7.95	14.92
A. *City Size*													
1. 1,000,000 +	9	72.07	72.39	94.63	7.77	8.08	10.64	34.41	52.93	9 .00	4.29	7.22	12.63
2. 500,000— 999,999	10	65.99	62.05	92.09	7.20	6.10	10.61	37.75	57.10	93.23	4.41	6.35	13.62
3. 200,000—499,999	54	65.11	63.92	93.88	7.80	8.06	11.12	34.64	56.00	92.59	4.59	8.18	14.12
4. 100,000—199,999	74	62.28	59.15	93.32	8.03	7.64	11.72	37.21	57.27	93.11	5.09	8.09	15.97
B. *Growth Rates*													
1. High	68	65.80	65.60	94.27	8.93	8.93	13.01	33.20	55.52	93.04	4.93	8.85	16.58
2. Medium	51	62.78	58.62	93.26	6.71	6.44	9.68	38.27	57.24	93.22	4.56	7.12	13.23
3. Low	26	62.31	57.82	92.40	6.63	6.22	9.30	39.11	55.35	92.33	4.45	6.65	13.01
C. *Functional Specialization*													
1. Manufacturing	68	64.95	64.55	93.23	8.48	8.24	12.22	36.10	57.92	92.54	5.27	8.86	16.38
2. Trade and Transport	58	63.45	59.23	93.90	7.55	7.28	11.02	37.41	56.03	93.16	4.80	7.37	14.60
3. Services	21	63.67	60.76	93.44	6.83	7.25	9.49	32.71	53.26	93.05	3.36	6.61	11.91
D. *Length of existence as Class I City*													
1. Prior to 1901	25	68.64	67.16	93.38	6.44	6.19	9.13	37.64	56.45	92.62	3.79	6.05	10.88
2. Between 1901 and 1951	24	64.28	60.57	93.14	7.68	7.72	10.43	36.95	55.57	92.67	5.09	7.74	14.06
3. Since 1951	87	62.37	60.00	93.43	8.37	8.12	12.24	36.78	56.95	92.91	5.27	8.49	16.37
4. New cities	10	68.69	68.08	96.16	7.44	7.85	11.21	24.54	55.42	93.98	2.54	8.54	14.49
E. *Regional Type*													
1. Himalayan	6	67.58	64.32	92.26	8.20	7.94	11.47	29.08	43.96	89.11	4.76	7.98	14.97
2. Upper Ganga plains	24	67.09	66.79	93.27	4.47	4.60	6.02	33.88	57.34	92.86	1.88	4.36	7.65
3. Middle & Lower Ganga plains	21	63.46	53.05	92.59	4.79	4.24	6.51	38.48	52.86	91.68	2.72	3.88	8.33
4. Central plateau	27	65.38	65.05	94.73	8.05	7.81	11.99	32.77	56.56	93.65	4.16	7.40	16.72
5. Deccan plateau	35	61.22	59.15	93.72	9.35	8.89	14.22	37.93	59.32	93.85	6.42	10.30	18.87
6. Coastal plains	34	64.04	63.86	93.34	10.48	10.75	14.64	38.32	57.54	92.60	7.03	11.02	18.64

Table 11 : Industrial classification of workers of each sex in the total population, among non-migrants, and migrants—migrants being further classified by different migration streams

Sex	Total population or type of migration stream	Rural or Urban	Industrial Categories of the Workers: Agriculture	Mining & quarrying	Manufacturing	Construction	Trade and Commerce	Transport & communication	Other services	Total	Broad Industrial Categories: Primary	Secondary	Trade and transport	Services
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Both	Total population		7.58	0.90	28.56	3.79	19.99	11.75	27.43	100.00	8.48	32.35	31.74	27.43
	Non-migrants		10.61	0.82	31.03	3.91	20.23	10.78	22.62	99.99	11.42	34.94	31.01	22.62
	Migrants	Total	5.29	0.92	24.53	3.36	19.75	12.61	33.55	100.01	6.21	27.90	32.35	33.55
	Resided in India	R	7.35	1.09	25.59	3.89	17.92	12.28	31.87	99.99	8.44	29.48	30.20	31.87
		U	2.42	0.62	23.52	2.91	18.95	13.63	37.96	100.01	3.03	26.43	32.58	37.96
	Elsewhere in the distt. of enumeration	R	10.86	0.97	24.08	3.64	17.49	11.49	31.47	100.00	11.82	27.72	28.98	31.47
		U	3.94	0.66	23.62	3.16	18.49	12.64	37.48	99.99	4.60	26.78	31.13	37.48
	In other districts of the same State	R	5.25	0.76	24.87	3.59	17.98	13.04	34.50	99.99	6.01	28.47	31.02	34.50
		U	2.24	0.48	21.74	2.83	17.33	13.98	41.40	100.00	2.72	24.57	31.32	41.40
	In other states	R	3.04	1.12	25.88	3.39	23.81	12.24	30.52	100.00	4.16	29.27	36.05	30.52
		U	1.88	0.70	25.92	2.66	23.43	13.40	32.01	100.00	2.57	28.59	36.83	32.01
Males	Total population		7.15	0.90	28.74	3.84	21.23	12.62	25.51	100.00	8.05	32.58	33.85	25.51
	Non-migrants		10.42	0.82	31.14	4.04	21.36	11.56	20.65	99.99	11.24	35.18	32.92	20.65
	Migrants	Total	4.55	0.90	24.78	3.35	21.18	13.63	31.63	100.02	5.44	28.13	34.81	31.63
	Resided in India	R	6.27	1.06	25.76	3.80	19.22	13.31	30.59	100.01	7.34	29.55	32.53	30.59
		U	2.18	0.60	23.96	2.98	20.35	14.72	35.21	100.00	2.78	26.94	35.07	35.21
	Elsewhere in the district of enumeration	R	9.23	0.93	24.33	3.65	18.84	12.65	30.36	99.99	10.16	27.98	31.50	30.38
		U	3.30	0.64	23.57	3.21	19.91	13.91	35.46	100.00	3.94	26.78	33.82	35.46
	In other distts. of the same State	R	4.69	0.74	25.14	3.49	19.22	14.05	32.67	100.00	5.43	28.63	33.27	32.67
		U	2.13	0.46	22.35	2.95	18.64	15.25	38.22	100.00	2.59	25.30	33.89	38.22
	In other States	R	2.73	1.12	26.25	3.31	25.06	12.81	28.72	100.00	3.85	29.56	37.87	28.72
		U	1.69	0.70	26.64	2.70	24.99	14.23	29.05	100.00	2.39	29.34	39.22	29.05
Fe-males	Total population		11.07	0.93	22.16	3.38	8.55	4.02	49.89	100.00	12.00	25.54	12.57	49.89
	Non-migrants		12.45	0.84	24.87	2.69	9.17	3.67	46.31	99.99	13.29	27.56	12.85	46.31
	Migrants	Total	10.67	1.08	18.83	3.58	8.09	4.10	53.65	100.00	11.75	22.41	12.19	63.65
	Resided in India	R	15.07	1.21	20.19	4.90	8.54	4.22	45.86	99.99	16.29	25.09	12.76	45.86
		U	4.30	0.72	16.67	2.33	7.39	3.94	64.66	100.01	5.02	18.99	11.33	64.66

rural and urban migration streams, indicate the nature of the pulls of city economy, and reflects the extent to which the mix of the two modifies the overall pattern of economic activities. The industrial classification of all workers in class I cities, non-migrant workers, and migrant workers by sex[8] (Table 11) indicates that 7.6 per cent of all workers in class I cities were engaged in agricultural and related primary activities. The proportion is significantly higher for non-migrants than migrants and, similarly, for females than males. There is, however, no significant difference in the employment of male and female non-migrant workers in primary activities. The difference between the non-migrant and migrant female is also small and non-significant.

The non-migrant workers are proportionately more in manufacturing sector than the migrant workers but the reverse is true with respect to services sector. "Trade and Commerce" and "Transport, communication and storage" sectors have almost the same proportions of migrant and non-migrant workers. Even in manufacturing cities which are supposed to attract industrial labour from different places, the proportion of non-migrant workers in "manufacturing" sector is higher (38.7 per cent) than of migrant workers (32.7 percent). This might mean that the industrial pull in these cities is no longer as great as it is generally believed to be.

As the services sector is a mixed sector involving all professional, technical and related workers on the one hand, and those providing personal services or working as maid servants on the other, it is difficult to say much about the nature of employment of the migrant workers vis-a-vis the non-migrant ones. Mitra *et. al.* (1980 : 151) think that the migrants to the cities have little skill education and training and, as such, most of them are absorbed in either low-grade services or in low-grade production process activities and indigenous means of transport. This aspect will be analysed here with the help of data on occupational classification of migrant and non-migrant workers.

Industrial classification of the migrant workers by rural and urban residence shows a higher proportion of rural migrants in primary and secondary sector activities, and the urban migrants in tertiary activities. The differences, however, are not very large. Further, intradistrict migrants were engaged in primary sector activities to a somewhat greater extent than interdistrict or interstate migrants. No significant difference is observed in the pattern of employment in the secondary sector activities but the employment of interdistrict migrants particularly from urban areas in services was significantly higher than of migrants in other streams; similarly the employment of interstate migrants was significantly higher in Trade, Commerce, transport, communication and storage sector. This observed pattern, however, needs further probing for possible reasons.

Occupational Classification of Migrant and Non-Migrant Workers.—As the occupational pattern of workers is not available for each city, resort was made to consider the occupational pattern of urban population of the district as representing that of the city in those cases where city's population was more than 85 per cent of district's urban population. Thus occupational pattern became available for 17 cities and, after subtracting the information for migrant workers, the pattern for non-migrant workers has been obtained. These data presented in Table 12 by sex clearly indicate that a significantly higher proportion of male and female migrants were engaged in profession, technical, administrative, executive and managerial types of jobs than non-migrants. The proportion of male migrants was significantly higher than non-migrants in clerical and related occupations also. In contrast, the proportion of non-migrants (both males and females) was much higher than migrants in production process activities. A higher proportion of migrant males were found engaged in service activities than non-migrant males but the reverse held good for females.

Table 12 : Occupational distribution of migrant and non-migrant workers of selected cities, 1971

	Occupational division	Migrants		Non-migrants	
		Males	Females	Males	Females
0—2.	Professional, technical, administrative, executive, managerial and related workers	15.67	37.34	8.53	27.24
3.	Clerical and related workers	18.44	8.36	13.42	7.50
4.	Sales workers	12.23	6.00	15.97	8.25
5.	Service workers	12.69	19.47	8.76	23.28
6.	Farmers, fishermen, hunters, loggers and related workers	1.05	0.99	1.68	1.31
7—9.	Craftsmen, production process workers and labourers not elsewhere classified	36.79	26.88	49.88	31.40
X.	Workers not classifiable by occupation	3.01	0.98	1.76	1.01

[8]Information regarding female migrants is limited to total and with last residence in India by its rural and urban status. Further breakdown by migration streams is not given in Table 11 since the number of workers in different industrial categories became too small for a large number of cities and did not provide reliable estimates.

The data for the 17 cities relating to the educational attainment of the migrant and non-migrant workers (Table 9) and their occupational placement (Table 12) thus contradict the findings of 'Mitra *et al.* who say that migrants to the cities have little skill, education, and training and, as such, most of them are absorbed in either low grade services or in low grade production process activities and indigenous means of transport (1980:151). The data also establish that the migrants to cities come because of their pull and not so much due to the push from rural areas. It is also quite likely that a large proportion of workers in white collar jobs have come to the cities from other cities or non-city urban areas as two-fifths of the migrants to class I cities came from urban areas (Table 3) but this can be established only after an analysis of the occupational placement of workers by different migration streams.

Conclusion

Analysing the 1971 census data relating to the migrants to cities with population 100,000 and over this paper has brought out certain patterns of cityward migration as well as the differentials in the characteristics of the migrants according to the migration streams, the characteristics of the cities, and in comparison to the non-migrants and has provided an improved documentation of this phenomenon.

Lifetime migrants to class I cities comprised two-fifths of their 1971 population, the proportion of females being slightly higher than males, which negated the view that migration to cities is male selective. The proportion of migrants was comparatively higher in cities with high growth rates, in cities with administrative and service functions, in new cities, or in those which belong to central plateau or coastal plains.

Among the inmigrants, rural migrants exceeded the urban migrants by 12.5 per cent (Table 3). In comparison to the population of sending areas, however, urban migration to class I cities seems to be much greater than rural migration.

Rural migrants prefer to go to the nearest city in greater proportion than urban migrants probably because a high proportion of rural migrants are illiterate and the available intervening opportunities hold them as soon as they get them.

Although the sex ratio of the lifetime migrants was lower than that of total population of the cities, the sex ratio of the current migrants (with duration of residence less than one year) was much higher pointing to male selectivity. Mitra had also observed that "female migration improves over time and is generally at its worst for shorter durations, particularly less than one year and less than five years" (Mitra. 1967 : 608). To understand the processes more clearly, it is necessary to have an analysis of both in-and out-migration of women.

The literacy rate of the migrants was much higher than non-migrants but this required standardisation for differentials in sex and age composition of the two sub populations which could be done if data on literate and educated persons were available by sex and age.

Illiterate migrants generally travelled short distances as compared to literate and educated migrants. Similarly, educational attainment of short-distance migrants was comparatively lower than other migrants.

The educational qualification of migrant workers were found to be much higher than non-migrant workers. They were significantly more than non-migrants with matriculation and higher qualifications.

Work participation rates of male migrants were significantly higher than non-migrants for all categories of cities. The rates were higher for migrant males aged 15-29 but there was no difference in 30-59 age group. While the work participation rate of migrant females was higher than non-migrant females, the opposite was true for 30-59 age group, and there being no significant difference in the work participation rate of women aged 15-29. It is, therefore, necessary to make a detailed analysis of the socio-economic factors associated with work participation of non-migrant and migrant females.

Occupational classification of the migrant and non-migrant workers for certain selected cities has indicated that the proportions of migrant workers in white-collar jobs-particiularly professional, technical, administrative, executive and managerial—is significantly higher than of non-migrant workers. In contrast, non-migrant workers are more in production process activities.

The data for the Indian cities analysed in this paper establish that there is a high proportion of urban to urban migration part of which seems to be turn-round migration among the class I cities themselves, the sex-ratio among the lifetime migrants is not higher than the total population of the cities, in fact, it is significantly lower. The educational attainment of the migrants is higher than non-migrants and they are better placed occupation-wise than non-migrants.

The analysis in this paper indicated that migration to cities of the middle and lower Ganga plains was the lowest, the current migration was almost half in comparison to other cities. The level of education of the migrants to the cities of this region was comparatively low and, in many of the cities, the work participation rates of the migrants were also very low.

Some of the cities, particiularly those belonging to the Deccan plateau and coastal plains region had high proportions of infra-district, or short distance migrants. It would be useful to analyse the reasons for this selectivity and relate it with the economy of these cities.

What will be structure 25 or 50 years hence of the population of those cities which are comparatively new and have a high proportion of migrants now? This question becomes important from the planning point of view to answer the related question: Is it economically more advantageous to construct more and more cities or should efforts be made to improve the economy of the stagnating cities or of the already existing medium and small towns? To my mind, it may be more useful to restructure the economic base of the inter-mediate cities and medium sized towns so that they become the Focal points for achieving balanced regional devolpment.

Acknowledgement

The major part of the analysis presented in this paper was carried out by the author at the East-West Population Institute, East-West Centre, Honolulu during 1980-81. The research was supported from the U.S. A.I.D. grant to the Institute for the project "Migrants and the City" under contract No. 19D400 Prof. James T. Fawcett, Coordinator of the project, took keen interest in this project and I am grateful to him. Mrs. Judy Ann L. Tom, Computer Analyst at the EPPI did all the programming for this project for which I am grateful to her. Mr. Zohair Anwar of the Centre for the Study of Regional Development prepared the graph and I appreciated his help.

PATTERNS AND CHARACTERISTICS OF IN-MIGRANTS IN METROPOLITAN SETTLEMENTS OF MAHARASHTRA AND ANDHRA PRADESH

MANZOOR ALAM, K.N. GOPI AND MANISHA MOOKHERJEE

Introduction

Geographic mobility of people within a country is a demographic response to disparities in regional levels of socio-economic development. Regions of higher economic development with higher incomes and wages tend to attract people and particularly economically active population, from regions/areas with relatively lower levels of development and consequently lower rates of wages and incomes. In the developing countries of the world these variations in regional levels of economic development and consequent income differentials may partially be due to natural resource endowment factors but largely due to historical and political factors. Most of these countries till the last World War were under the political control of the West European powers. The economic policy of the colonial powers led to the concentration of developmental activities in certain ecological niches which subsequently became the foci of economic and political powers. This naturally resulted in the outflow of population from the neglected less developed areas to the developed pockets during the colonial rule. Because of the historical inertia the process has continued in India even after thirty years of independence. Within these developed pockets the inmigrants have largely tended to flock into the large metropolitan cities.[1] Therefore, in the dynamics of metropolitan growth in India and other developing countries of the world inmigration plays a key role in the social and economic transformation of these cities.

Since metropolitan cities attract most of the migrants it is proposed to examine the overall pattern of inmigration and of its quality and character in the metropolitan settlements of the states of Maharashtra and Andhra Pradesh which constitute part of the Bombay Metropolitan System (Centre for Urban Research: 1980) and also to specifically examine;

(1) if there is any relationship between distance and volume of migrants in order to test the distance decay hypothesis, and

(2) if the primate cities of Bombay and Hyderabad exercise a high degree of gravitational pull on inmigrants.

The analysis is based on the census data (1971) and therefore suffers from the constraints of that data.[2]

Growth of Population in Metropolitan Cities

The concentration of urban population in metropolitan cities is a global phenomenon and is, borne out by the fact that between 1880 and 1960, the annual average growth rate of urban population increased more than five fold while the metropolitan cities experienced a 70 fold increase from 0.01 per cent during the first half of the 19th century to 0.7 per cent during 1950-60. The second half of the 20th century has been notable for a phenomenal rise in the share of urban population in the share of the larger cities to the total urban population (Kantsebovskaya ; 1976).

Although India, with only 20 per cent of its total population living in urban areas (1971) is not among the highly urbanised countries it has nevertheless a sizeable urban population of 109 million, the third largest urban population in the world (excluding China), the first two being U.S.A. and U.S.S.R.

The urban population of India has been growing continuously since 1901 and during the last seventy years it has increased from 25.85 millions in 1901 to 109 millions in 1971 an increase by about four times, but during the same period the metropolitan population has snowballed from 5.6 million to 60.6 millions, a rise of nearly 11 times. It is observed that since 1931, the rate of urban growth has accelerated, but that of metropolitan population has been spectacular (Table 1.0). This table further highlights the fact that "Metropolitan Settlements constitute only a minor fraction, 5.6 per cent of the total number of urban settlements (1971), yet they dominate the urban population and account for 11 per cent of the country's total population and 56 per cent of its urban population. The excessive concentration of population in a few larger settlements leads to an ever increasing gap between rural and urban sectors of the economy often resulting in many social, economic and spatial development problems." (Alam, et.al., 1974). Wide disparities in levels of development creates dissatisfaction of people with the contemporary environment, induces geographic mobility of people and urges them to move to fresh pastures in search of better economic opportunities and better income. (Wills : 1974) (Gohman, et.al., 1976).

[1] Designation of Urban Settlements with population exceeding 1,00,000 as metropolitan settlements is based on the definition given by the International Urban Research Centre, Berkeley, California, quoted by Gibbs p. 5(ed) in *Urban Research Methods*, Van Nostrand, New Delhi, 1966, p. 438.

[2] A comparative analysis through the decade could not be attempted because of definitional change adopted by Census for 1971 from 'Place of Birth' to 'Place of Last Residence'. Secondly as details of movement from one district to other is not available, the distance decay factor on migration could not be adequately analysed. Lastly the study is limited to just inmigration in to the metropolitan cities, and does not include outmigration component, as data is not provided by the Census.

Metropolitan Cities and Migrant Population

Metropolitan cities have generally a large component of migrant population. This is brought out by data on Table 2.0 giving the percentage of migrant population in the metropolitan cities of Andhra Pradesh and Maharashtra. In these cities, the percentage ranges between 29.45 (min) and 67.08 (max) in Maharashtra, and between 22.52 and 50.95 in Andhra Pradesh. Of the two apex cities, Bombay and Hyderabad, the latter has an abnormally low proportion of migrant population for a city of its size. This might be due to the political agitation which was launched in Telengana during 1968-69 and particularly in the capital city of Hyderabad, against the people from outside the Telengana region. The greater degree of magnetic pull of Bombay compared to Hyderabad is emphasised by the fact that the former received during the 1961-71 decade eight times the number of migrants in Hyderabad and within Maharashtra it has six times the number of migrants to the next ranked town Poona. The number of migrants in Hyderabad is only two and half times of its next ranked town Vishakhapatnam.

There seems to be a direct relationship between the population size of the metropolitan settlements and the volume of migrants. It can be observed from table (2.0) and Fig. (1) that Bombay and Hyderabad, the two largest cities in their respective states attract largest volume of migrants. The first three cities together in both Maharashtra and Andhra Pradesh attract the bulk of inmigrants i.e. 75 and 53.8 percent in their respective states. As a further step in testing the hypothesis that larger the population size of an urban settlement greater the volume of migrants, a rank correlation analysis between the two variable (a) volume of migrants and (b) population size of a town has been made. The rank correlation coefficients highlight the fact that in both the states there exists a strong positive correlation between the two variables, $r=0.97$ in case of Maharashtra and $r=0.92$ for Andhra Pradesh. This suggests snowballing effect of the larger urban settlements and their capacity to attract greater volume of migrants resulting in an accelerated functional and demographic growth, and also accentuating the income differentials between metropolitan settlements on the one hand and rural and medium to small urban settlements on the other.

The volume of migrants seems to be directly related to the functional character of the metropolitan settlements. At the national level the multifunctional capital cities such as Bombay, Ahmedabad, Bangalore, Hyderabad, Delhi, Jaipur, Calcutta, Madras, etc. attract the largest number of inmigrants in their respective states. The next in order of gravitational pull are the metropolitan cities where industrial functions predominate. This is particularly true in case of Maharashtra and Andhra Pradesh. The industrial towns of Poona, Ulhasnagar and Thana in Maharashtra and Guntur and Vishakapatnam in Andhra Pradesh are among the principal metropolitan centres where migrants converge.

Distance Factor in Migration

The friction effect of distance on migration is borne out by table 3.0 and Fig. (2). It can be inferred from the table that by and large the migration patterns in Andhra Pradesh and Maharashtra conform to the distance decay hypothesis' of Ravenstein. (Connell John et al., : 1976). In both the states a larger proportion of the migrants are from within the district and as the distance increases the volume of migrants tend to decrease. A closer analysis of the data reveals subtle differences between the migration patterns in Maharashtra and Andhra Pradesh. While in the former the inter-district migrations are dominant, in the latter intra-district migration predominates.

The contribution of the neighbouring states to the migrant component of the states of Andhra Pradesh and Maharashtra and their metropolitan cities is brought out by tables 4.0 and 4.1 and fig. 3. It seems that both distance and historicity are important elements in determining the quantum of migrants from the neighbouring states. Maharashtra received the largest number of migrants from the state of Gujarat which until 1960 was a part of the erstwhile state of Bombay. Similarly the states of Tamilnadu, Karnataka and Maharashtra contribute almost equal number of migrants to Andhra Pradesh largely because of past historical association. The Marathwada and Kannada parts of the states of Maharashtra and Karnataka formed until 1956 part of the erstwhile state of Hyderabad, and until the same period the Coastal Andhra and most of Rayalaseema were administratively linked to the former state of Madras.

In addition to historical association, distance is a significant factor in determining the mobility of people from the neighbouring states. The bulk of the migrants in Aurangabad and Nanded are from the neighbouring Andhra Pradesh whereas in Sholapur, Kolhapur and Sangli they are from the adjoining State of Karnataka. The State of Madhya Pradesh sends the largest number of migrants to the nearest metropolitan settlement, Nagpur. The pattern in Andhra Pradesh is strikingly similar. Metropolitan Vishakapatnam receives the largest number of migrants from neighbouring Orissa and the bulk of inmigrants in Nellore are from Tamilnadu, the next door neighbour.

The primacy of Bombay and Hyderabad is evident from the fact that in their respective states they receive the largest proportion of migrants from outside the neighbouring states, 27.80 and 13.46 per cent respectively. The higher proportion of migrants in Bombay, in this category, also reflects its status as the primate city of one of the national metropolitan systems (The Bombay System) which includes even the Hyderabad Sub-System. Presumably due to their proximity with Bombay and being the beneficiaries of spill over effect of its development. Ulhasnagar and Thana attract a significant portion of their inmigrants from outside the state. (Table 3.0).

Rural—Urban Components of Inmigrants

Of the four streams of migration[3] the two contributing to the urban demographic growth are rural to urban and urban to urban. The trend and pattern of migration, as already explained earlier is largely determined by the differences in income levels caused by inequalities in economic and employment opportunities. It has been hypothesised that the "Push" factor operates when the low level of productivity in the agricultural sector adversely affects employment opportunities in the rural settlements and thus forces the rural working population and particularly the landless labour class to move to larger urban centres in search of employment. The vastly improved educational and medical facilities and concentration of commercial banking, administrative and industrial functions and their higher wage structure in metropolitan settlements enhance their attractive power to "Pull" workers not only from rural areas but also from smaller urban centres. Thus the "Push" and the "Pull" factors have combined together to accelerate the inflow of migrants into metropolitan centres. Unfortunately in a developing economy like India the "Push" factor seems to dominate population movements. This negative factor based on out-migration from rural settlements swells demographically the size of metropolitan settlements but does not contribute positively to strengthening their economic base. On the contrary it reduces the economic dynamism of metropolitan settlements by increasing their labour force which cannot be gainfully employed. While the "Pull" factor induces migration due to the inherent dynamism of the metropolitan economy but the number of inmigrants attracted by this factor far exceeds the number of jobs available. This coupled with the negatively induced inmigrants from rural and smaller urban settlements generate the growth of informal sector economy in a metropolitan setting, resulting in the emergence of dualism in the structure of metropolitan economy.

Barring a few exceptions it is the negatively generated out-migration from the rural settlements due to the "Push" factor that determines the larger quantum of influx of migrants into the metropolitan settlements of both Maharashtra and Andhra Pradesh. Compared to Maharashtra, migrants in Andhra Pradesh are more of rural origin. Tenali, a town in Andhra Pradesh has of all the cities, of the two states, the largest proportion of its migrants (72%) from rural areas. In the former state there are three settlements i.e., Ulhasnagar (64%), Thana (61%) and Bhusawal (52%) where urban to urban migration due to "Pull" factor are more important. In Andhra Pradesh metropolitan Hyderabad (54%) is the only settlement where urban to urban migration is notably marked. Visakhapatnam (45%) is the other settlement which shows some urban bias in its inmigration pattern.

While table 5.0 and 5.1 and Fig. (2) also support the distance decay hypothesis in the mobility of population in both rural to urban and urban to urban streams of migration. They however are more revealing in regard to the magnetic pull of both Bombay and Hyderabad. While Hyderabad has a significant proportion of urban migrants from longer distances i.e., from the neighbouring and non-neighbouring states, it is in metropolitan Bombay that the influx of rural inmigrants from greater distances is even more marked. The long distance inmigrants in Bombay constitute a majority of the total urban migrants in that city. While not ignoring the negatively induced influx of migrants to Bombay, one cannot overlook the tremendous magnetism of this primate city to draw migrants from diverse settings and from the remotest parts of the country.

Inmigrants as Workforce in Metropolitan Cities

In the Metropolitan Settlements of both the States inmigrants constitute an important segment of the total workforce but the dependence of Maharashtra on migrant labour is more marked (Table 6.0.). On an average nearly 69 per cent of the working population in the metropolitan cities of this state consists of inmigrants and there are three cities including Bombay, Ulhasnagar and Thana which have more than 70 per cent of migrants in their labour force. On an average Andhra Pradesh has a little over 44 per cent of migrant labour force and Vijayawada records the maximum of 65 percent of migrant labour.

The migrant labour force in both the States is very unevenly distributed even among the metropolitan cities. The first three cities of both Maharashtra and Andhra Pradesh contain 80 and 56 per cent respectively of the total migrant labour in their metropolitan cities. This is presumably due to enormous inequality in the location and distribution of economic opportunities. That most of the inmigrants are sucked in by Bombay is evident from table 6.0. Hyderabad is a very poor second to Bombay. It has only 34 percent of migrant labour force and the absolute size of its migrant working population is even less than that of the city of Poona which has only half the population of Hyderabad.

Inmigrants and Employment Sectors

Most of the migrant workers in the two states are absorbed in the tertiary sector since this sector provides ample scope for the expansion of the informal sector which seems to be an essential component of the metropolitan cities in the developing countries (Table 7.0 and Fig. 4). Exceptions to this generalisation are provided by the cities of Malegoan (76%), Thana (58%), Sholapur (53.68%) and Ulhasnagar (50.53%) in Maharashtra where the organised industrial sector attracts a majority of the migrant labour force from outside. (Tables 8.0 and 8.1). The weakness of the economic base of the metropolitan cities in the two states is suggested by the high proportion

[3] The four streams of migration are:

Rural to Urban
Rural to Rural
Urban to Urban
Urban to Rural

of workers employed in the tertiary sector and is confirmed in the case of those cities which together with this sector have a fairly high proportion of migrant workers in the primary sector as well. The weakness of the economic base of cities is even more marked in Andhra Pradesh for there is no city in that state with a dominant industrial or secondary sector and 9 of its 13 metropolitan cities have relatively high proportion of inmigrants employed in primary activities (Table 7.0).

Distribution of Migrant Workers and Primate Cities

Rural India is a reservoir of surplus labour force. This is evident from the fact that in most of the metropolitan cities, in both the States, more than 60 percent of the working migrants are with rural background (Table 9.0). These metropolitan cities attract quite a significant portion of their work force even from smaller urban centres which is indicative of the social and economic weakness of the latter category of towns and of their inability to retain their workforce because of lack of sufficient job opportunities and significant wage differentials between metropolitan and non-metropolitan settlements. This system of draining out of the labour force from rural and smaller urban settlements to the metropolitan settlements is directly linked to the economic system that has emerged in the country.

The primate city distribution dominates the settlement systems of both Andhra Pradesh and Maharashtra and is amply reflected in their migration patterns. Metropolitan Bombay being located at the apex of both the Maharashtra Settlement system and one of the national metropolitan systems (i.e., The Bombay System) possesses a much higher degree of primacy than metropolitan Hyderabad which is located at the apex of a sub-system within the Bombay metropolitan system. The volume of inmigration in Bombay during 1961-71 exceeded the total volume of immigration in the whole state of Andhra Pradesh, in the corresponding period. The number of migrant workers in this metropolis is approximately 67 per cent of total migrant workers in all the metropolitan cities of Maharashtra. The role of Bombay in attracting a major part of the flow of migrant workers is reflective of its role as the primate city of the macro Bombay System. The primacy of Hyderabad in the settlement system of Andhra Pradesh, though not as pronounced as that of Bombay, is nonetheless well marked and highlighted by table 9.0.

It can also be observed from table 10.0 that metropolitan Bombay attracts nearly two-thirds of the total literate migrants and approximately above sixty per cent of the highly educated and technically qualified migrants in Maharashtra, whereas, Hyderabad attracts only one-third of the total literate migrants and nearly fifty per cent of highly educated and technically qualified migrants in Andhra Pradesh. It is also noticeable that in both the primate cities, Bombay and Hyderabad, there is a hyper concentration of migrants employed in senior profession and managerial cadres (Fig. 5).

It seems that there is an extremely uneven distribution of economic and social opportunities even among the metropolitan settlements. It can be observed from tables 10.0 and 10.1 that the bulk of migrants are attracted to the first four metropolitan settlements which also claim most of the highly educated migrants and those employed in superior positions in various services. It can be surmised that the movement of migrants is directly related not only to their perceptions of job opportunities in different settlements but also to the actual availability of jobs in them. If this is the degree of difference in the availability of jobs among the metropolitan settlements then the position must be much worse in the urban settlements with less than 100,000 population. It is the absence of intervening opportunities at different levels of urban settlement system that leads to the concentration of migrant population in the primate cities. Unless this is rectified through a proper investment strategy to boost the development of lower order urban settlements, a location strategy to decentralise functions from the primate cities, through the restructuring of wages to minimise income differentials and an overall regional and urban development strategy aimed at stimulating accelerated development of non-metropolitan and lower order metropolitan settlements, the atrophied development of the system of cities in India cannot be avoided.

References

1. Alam, Manzoor S., Rao, Ram Mohan and Gopi, K.N. : "Trends and Patterns of Metropolitan Development in India", *Occasional Paper No* 3, Centre for Urban Research, Osmania University, Hyderabad, July 1974, p. 2 (Mimeographed).

2. Centre for Urban Research, "India: Metropolitan System and their Structure," *Technical Bulletin No.* 1, (1980), Osmania University, Hyderabad (A.P.).

3. Connell John, Dasgupta Biplab et. al. : "*Migration from Rural Areas*," Oxford University Press, Delhi, (1976). p. 72.

4. Gohman V.M., and Lappo G.M. et. al. : "The Economic Geographical Aspects of World Urbanization and and its specific features in Developing Countries," in *Urbanization in Developing Countries*, Alam, Manzoor S. and Pokshishersky V.V. (eds), Osmania University, (A.P.), India (1976), p. 39.

5. Kantsebovskaya, I.V. "Some Definitions of Urbanization in Geographic Literature and the Relevant Ideas," in Alam Manzoor S. and Pokshishersky V.V. (eds), *Urbanization in Developing Countries*, Osmania University, Hyderabad, (A.P.) India (1976) p. 3.

6. Wills, K.G. (1974), *Problems in migration analysis*, Heath and Co., Lenington Books, Lenington p. 16, in Pryor, Robin J. (ed) *Migration and Development in South East Asia—A Demographic Perspective*, Oxford University Press, New York, (1979), p. 3.

Table 1.0 : India: Urban and Metropolitan Growth and Population, 1901—1971

Year	No. of urban settlements	Urban population		No. of Metropolitan settlements	Metropolitan settlements as per cent of total urban settlement	Metropolitan Population			Non- Metropolitan Population		Population growth rate per annum			Average pop. of Metropolitan settlements
		Actual in miln.	Per cent to total pop.			Actual in miln.	Per cent to total Urban pop.	Per cent to total pop.	Actual in miln.	Per cent to total pop.	Total pop.	Total urban pop.	Metropolitan pop.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
												1901—31		
1901 .	1851	25.85	10.8	25	1.3	5.69	23.0	2.4	20.16	8.4				22800
1931 .	2145	33.46	12.0	35	1.6	8.17	27.0	2.9	25.29	9.1	0.6	1.0	1.4	263000
												1931—41		
1951 .	2924	62.44	17.3	81	2.8	23.73	42.0	6.6	38.71	10.7	1.5	4.3	9.5	312000
												1941—51		
1971 .	2626	109.09	19.9	148	5.6	60.68	56.0	11.1	43.41	9.9	2.6	3·7	7·8	415000

Source : Manzoor Alam et. al., Trends and Patterns of Metropolitan Development in India, Occasional Paper No. 3, July 74, Osmania University. Hyderabad, p. 3.

Table 2.0 : Total Population and Migrants in Metropolitan Centres, 1971

Metropolitan Settlements	Total Population in '000	Total Migrants in '000	Migrants as per cent of the city population
1	2	3	4
MAHARASHTRA	11,117	5,521	49.66
1. Greater Bombay	5,970	3,274	54.84
2. Poona	1,135	540	47.56
3. Nagpur	930	332	35.67
4. Sholapur	398	117	29.45
5. Ulhasnagar	396	209	52.72
6. Nasik	271	126	46.47
7. Kolhapur	267	101	37.62
8. Thana	207	139	67.08
9. Sangli	201	93	46.08
10. Amravathi	194	89	46.11
11. Malegaon	192	66	34.32
12. Akola	168	78	46.20
13. Aurangabad	165	77	47.00
14. Ahmednagar	148	64	43.19
15. Dhulia	137	61	42.24
16. Nanded	126	51	40.31
17. Jalgaon	107	53	50.18
18. Bhusawal	105	51	48.77
ANDHRA PRADESH	4,063	1,380	33.97
1. Hyderabad	1,796	406	22.52
2. Vishakapatnam	363	161	44.87
3. Vijayawada	345	176	50.95
4. Guntur	270	122	45.17
5. Warrangal	207	58	28.22
6. Rajahmundry	189	89	41.82
7. Kakinada	164	65	39.53
8. Kurnool	137	46	33.81
9. Nellore	133	56	41.76
10. Eluru	127	52	41.30
11. Nizamabad	116	51	43.98
12. Machilipatnam	113	50	44.17
13. Tenali	103	48	46.75

Source: *Maharashtra*: Compiled from Census of India 1971, Vol. Part II-D and Part II-A(i).
Andhra Pradesh: Compiled from Census of India 1971, Vol. Part II-D and Part II-A (i).

Table 3.0 : Per cent Distribution of Migrants by Place of Origin, 1971

Metropolitan Settlements	Within the State		Neighbouring States*	Non-neighbouring States	Total
	Intra Distt.	Inter Distt.			
1	2	3	4	5	6
MAHARASHTRA	37.10	41.78	14.60	6.52	100.00
1. Greater Bombay	..	43.85	28.35	27.80	100.00
2. Poona	24.10	48.00	14.90	13.00	100.00
3. Nagpur	28.45	41.10	19.52	10.93	100.00
4. Sholapur	34.93	22.87	40.50	1.70	100.00
5. Ulhasnagar	10.28	57.00	15.60	17.13	100.00
6. Nasik	46.42	40.00	6.18	7.40	100.00
7. Kolhapur	44.87	32.00	21.53	1.60	100.00
8. Thana	11.22	64.36	10.94	15.07	100.00
9. Sangli	35.58	35.85	26.97	1.60	100.00
10. Amravathi	51.21	37.61	6.43	4.76	100.00
11. Malegaon	31.03	53.00	4.00	12.83	100.00
12. Akola	38.54	48.47	7.26	5.73	100.00
13. Aurangabad	42.82	43.15	9.14	4.89	100.00
14. Ahmednagar	41.02	35.40	6.65	16.93	100.00
15. Dhulia	39.84	52.32	4.32	3.52	100.00
16. Nanded	41.94	42.38	14.14	1.54	100.00
17. Jalgaon	64.76	26.02	6.37	2.85	100.00
18. Bhusawal	47.26	32.28	13.48	6.98	100.00
ANDHRA PRADESH	47.84	42.46	6.62	3.08	100.00
1. Hyderabad	7.84	57.97	20.73	13.46	100.00
2. Vishakapatnam	44.36	35.77	11.19	8.68	100.00
3. Vijayawada	40.33	53.69	4.26	1.72	100.00
4. Guntur	58.40	37.08	2.88	1.64	100.00
5. Warrangal	53.92	41.00	3.42	1.66	100.00
6. Rajahmundry	50.46	44.64	3.12	1.78	100.00
7. Kakinada	63.88	32.68	2.30	1.14	100.00
8. Kurnool	46.90	45.12	6.20	1.78	100.00
9. Nellore	59.61	27.72	10.90	1.77	100.00
10. Eluru	36.12	59.55	1.50	2.83	100.00
11. Nizamabad	31.03	52.35	15.65	0.97	100.00
12. Machilipatnam	65.28	31.00	1.95	1.77	100.00
13. Tenali	63.58	32.84	1.92	1.66	100.00

Maharashtra: *Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Goa, Daman & Diu.
Andhra Pradesh: *Maharashtra, Karnataka, Orissa, Madhya Pradesh and Tamil Nadu.
Source: *Maharashtra*: Compiled from Census of India, 1971, Vol. Part II-D.
Andhra Pradesh: Compiled from Census of India 1971, Vol. Part II-D.

Table 4 : Maharashtra : Contribution of Total Migrants to the Metropolitan Centres from Neighbouring States, 1971

Metropolitan Settlements	Andhra Pradesh	Gujarat	Madhya Pradesh	Karna-taka	Goa, Daman, and Diu	Total Migrants from neigh-bouring States	Andhra Pradesh	Gujarat	Madhya Pradesh	Karna-taka	Goa, Daman and Diu	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
MAHARASHTRA . . .	168000	558565	116865	377895	83725	1305050	12.9	42.8	28.9	28.9	6.4	100.00
1. Greater Bombay . . .	103105	505220	31840	245125	77935	963225	10.7	52.4	3.3	25.4	8.1	100.00
2. Poona	17925	13625	7340	40385	3270	82565	21.7	16.5	8.9	48.9	4.0	100.00
3. Nagpur	5205	5500	49175	1755	270	61905	8.4	8.9	79.4	2.8	0.4	100.00
4. Sholapur	19305	1045	340	27745	65	48500	39.8	2.1	0.7	57.2	0.13	100.00
5. Ulhasnagar	5150	11355	5280	10440	670	32895	15.6	34.5	16.1	31.7	2.0	100.00
6. Nasik	915	3315	2070	1570	145	8015	11.4	41.3	25.8	19.6	1.8	100.00
7. Kolhapur	275	1690	345	19175	280	21765	1.3	7.8	1.6	88.1	1.3	100.00
8. Thana	1715	6060	1005	4930	505	14215	12.1	42.6	7.1	34.7	3.5	100.00
9. Sangli	645	1490	170	22655	335	25295	2.5	5.9	0.7	89.6	1.3	100.00
10. Amravathi	440	1385	3860	165	25	5875	7.5	23.6	65.7	2.8	0.4	100.00
11. Malegaon	240	1085	1175	160	5	2665	9.0	40.7	44.1	6.0	0.2	100.00
12. Akola	525	1945	3360	125	20	5975	8.8	32.5	56.2	2.1	0.3	100.00
13. Aurangabad	4195	710	975	1280	75	7235	58.0	9.5	13·5	18.0	1.0	100.00
14. Ahmednagar	2050	585	835	830	55	4355	47.0	13.4	19.2	19.0	1.3	100.00
15. Dhulia	160	1270	1090	280	20	2820	5.7	45.0	38.6	9.9	0.7	100.00
16. Nanded	5730	470	245	905	5	7355	77.9	6.4	3.3	12.3	0.1	100.00
17. Jalgaon	60	1215	2055	90	10	3430	1.7	35.4	59.9	2.6	0.3	100.00
18. Bhusawal	360	580	5705	280	35	6960	5.2	8.3	82.0	4.0	0.5	100.00

Source : Compiled from Census 1971, Part II-D.

Table 4·1 : Andhra Pradesh: Contribution of total Migrants to the Metropolitan Centres from Neighbouring States, 1971

Metropolitan Settlements	Madhya Pradesh	Maha-rashtra	Karna-taka	Orissa	Tamil Nadu	Total Migrants from neighbour-ing States	Madhya Pradesh	Maha-rashtra	Karna-taka	Orissa	Tamil Nadu	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
ANDHRA PRADESH	5940	42645	35760	9870	44590	138705	4.3	30.7	25.8	7.1	32.1	100.00
1. Hyderabad	3380	29430	28425	940	21640	83815	4.0	35.1	33.9	1.1	25.8	100.00
2. Vishakapatnam	1960	3780	1250	7545	3755	18290	10.7	20.7	6.8	41.2	20.5	100.00
3. Vijayawada	75	570	1095	275	5485	7500	1.0	7.6	14.6	3·7	73.1	100.00
4. Guntur	75	225	640	175	2410	3525	2.1	6.4	18.1	4.9	68.4	100.00
5. Warangal	75	1045	435	25	425	2005	3.7	52.1	21.7	1.2	21.2	100.00
6. Rajahmundry	110	350	505	450	1380	2795	3.9	12.5	18.1	16.1	49.4	100.00
7. Kakinada	60	165	240	275	755	1495	4.0	11.0	16.0	18.4	50.5	100.00
8. Kurnool	25	165	1585	20	1075	2870	0.9	5.7	55.2	0.7	37.4	100.00
9. Nellore	10	130	445	..	5460	6055	0.2	2.1	7.5	..	90.2	100.00
10. Eluru	50	75	95	90	480	790	6.3	9.5	12.2	11.4	60.7	100.00
11. Nizamabad	30	6405	750	5	235	7465	0.9	85.8	10.0	0.7	3.1	100.00
12. Machilipatnam	35	135	190	60	555	975	3.6	13.8	19.5	6.1	56.9	100.00
13. Tenali	15	70	95	10	935	1125	1.3	6.2	8.4	0.9	83.1	100.00

Source : Compiled from Census 1971, Tables, Part II-D.

Table 5.0 : Maharashtra: Inmigration in Metropolitan Settlements by Status of Place of Origin, 1971

Metropolitan Settlements	Rural					Urban					Rural plus Urban
	Intra Dist.	Inter Dist.	N.S.	N.N.S.	Total Rural	Intra Dist.	Inter Dist.	N.S.	N.N.S.	Total Urban	
1	2	3	4	5	6	7	8	9	10	11	12
MAHARASHTRA . . .	27.7	19.7	6.6	4.2	58.2	8.2	20.8	7.7	5.1	41.8	100.00
1. Greater Bombay . . .	..	34.4	15.8	16.6	66.8	..	9.4	12.4	11.4	33.2	100.00
2. Poona	20.6	21.7	5.2	4.5	52.0	3.2	27.2	9.4	8.2	48.0	100·00
3. Nagpur	23.6	19.6	7.9	4.1	55.2	4.8	21.5	11.6	6.9	44.8	100·00
4. Sholapur	26.1	9.4	28.0	0.5	64.0	8.8	12.7	13.5	1.0	35.2	100.00
5. Ulhasnagar	5.8	17.6	5.8	6.8	36.0	4.1	39.6	9.8	10.5	64.0	100·00
6. Nasik	35.5	14.0	2.2	3.3	55.0	10.8	25.9	3.9	4.4	45.0	100.00
7. Kolhapur	38.6	12.8	11.5	0.6	63.5	6.5	18.8	10.2	1.0	36.5	100.00
8. Thana	5.8	21.6	3.8	8.2	39.4	5.4	42.8	6.2	6.2	60.6	100.00
9. Sangli	31.2	16.8	10.0	0.8	64.8	4.5	18.7	11.0	1.0	35.2	100.00
10. Amravathi	42.4	14.3	2.0	2.8	61.5	8.8	23.0	4.6	2.1	38.5	100.00
11. Malegaon	21.9	28.4	1.0	7.0	58.3	9.1	24.8	3.0	4.8	41.7	100.00
12. Akola	27.8	19.0	2.1	2.7	51.6	10.8	29.4	5.4	2.8	48.7	100.00
13. Aurangabad . . .	33.1	17.3	1.6	1.2	53.2	9.3	25.8	7.9	3.8	46.8	100·00
14. Ahmednagar . . .	36.5	14.4	2.8	9.7	63.4	4.5	22.5	3.8	5.8	36.6	100.00
15. Dhulia	32.1	27.4	1.8	2.0	63.3	7.7	24.6	2.9	1.5	36.7	100.00
16. Nanded	36.7	22.8	6.0	0.6	66.1	4.8	19.6	8.5	1.0	33.9	100.00
17. Jalgaon	57.2	7.5	1.7	1.6	68.0	7.7	18.0	4.6	1.7	32.0	100.00
18. Bhusawal	34.5	8.2	2.9	2.4	47.9	12.5	24.0	10.6	4.9	52.1	100.00

Source: Compiled from Census Vol. Part II-D, Table D-III.

N.S.: Neighbouring States.

N.N.S.: Non-neighbouring States.

Table 5.1 : Andhra Pradesh: Inmigration in Metropolitan Settlements by Status of Place of Origin, 1971

Metropolitan Settlements	Rural					Urban					Rural plus Urban
	Intra Dist.	Inter Dist.	N.S.	N.N.S.	Total Rural	Intra Dist.	Inter Dist.	N.S.	N.N.S.	Total Urban	
1	2	3	4	5	6	7	8	9	10	11	12
ANDHRA PRADESH . . .	39.1	22.9	1.8	1.1	64.9	9.0	19.4	4.7	2.0	35.1	100.00
1. Hyderabad	5.8	31.3	4.8	4.6	46.5	1.9	26.3	16.0	9.3	53.5	100.00
2. Vishakapatnam . . .	34.0	16.2	2.7	1.7	54.6	11.7	19.2	8.1	6.4	45.4	100.00
3. Vijayawada	31.0	32.5	0.7	0.8	65.0	9.3	21.2	3.6	0.9	35.0	100.00
4. Guntur	48.3	19.5	0.6	0.8	69.2	10.0	17.6	2.3	0.9	30.8	100.00
5. Warangal	49.2	19.0	0.8	0.7	69.6	4.7	22.0	2.7	1.0	30.4	100.00
6. Rajahmundry	36.8	25.1	0.8	0.7	63.4	13.6	19.6	2.4	1.0	36.6	100.00
7. Kakinada	47.9	13.4	0.5	0.6	62.4	15.7	18.9	1.9	1.1	37.6	100.00
8. Kurnool	39.1	28.0	1.5	1.0	69.6	7.5	17.4	4.7	0.8	30.4	100.00
9. Nellore	54.2	13.4	2.8	1.0	71.4	5.3	14.5	8.0	0.8	28.6	100.00
10. Eluru	29.3	34.5	0.3	0.2	64.3	8.0	25.8	1.2	0.7	35.7	100.00
11. Nizamabad	27.3	28.8	7.2	1.3	64.6	4.4	22.1	7.4	1.6	35.4	100.00
12. Machilipatnam . . .	54.1	16.1	0.3	0.5	71.0	12.3	14.7	1.6	0.4	29.0	100.00
13. Tenali	51.6	19.5	0.8	0.3	72.2	12.5	13.5	1.1	0.7	27.8	100.00

Source: Compiled from Census, Vol. Part II-D, Table D-III.

N.S. : Neighbouring States.

N.N.S. : Non-neighbouring States.

Table 6.0 : Distribution of Migrant Work force in Metropolitan Settlements, 1971

Metropolitan Settlements	Total Workers in the city in '000	Total Migrant Workers in '000	Migrant Workers as per cent to Total Workers in the city
1	2	3	4
MAHARASHTRA	3,640	2,505	68.82
1. Greater Bombay	2,198	1,673	75.11
2. Poona	337	212	62.90
3. Nagpur	255	130	50.93
4. Sholapur	113	42	37.16
5. Ulhasnagar	119	84	70.53
6. Nasik	75	43	57.43
7. Kolhapur	70	33	47.14
8. Thana	71	59	83.10
9. Sangli	55	31	56.36
10. Amravathi	42	29	69.04
11. Malegaon	54	25	43.14
12. Akola	45	27	60.00
13. Aurangabad	42	24	57.14
14. Ahmednagar	44	24	54.55
15. Dhulia	35	17	48.57
16. Nanded	32	18	56.25
17. Jalgaon	27	17	62.96
18. Bhusawal	26	16	61.53
ANDHRA PRADESH	1,187	528	44.43
1. Hyderabad	510	173	33.92
2. Vishakapatnam	100	53	53.00
3. Vijayawada	101	66	65.35
4. Guntur	89	51	57.30
5. Warangal	59	19	32.20
6. Rajhmundry	59	31	52.55
7. Kakinada	46	20	43.47
8. Kurnool	43	18	42.86
9. Nellore	40	20	50.00
10. Eluru	39	18	46.15
11. Nizamabad	39	22	56.41
12. Machilipatnam	31	15	48.39
13. Tenali	31	17	54.84

Source: *Maharashtra*: Compiled from Census 1971, Part II-D, Table D-V and General Population Tables, Part II-A(i).
Andhra Pradesh: Compiled from Census 1971, Part II-D, Table D-V and General Population Tables, Part II-A(i).

Table 7.0 : Distribution of Migrant Workforce in Metropolitan Centres by Broad Activity Group, 1971

Metropolitan Settlements	Primary	Secondary	Tertiary	Total
1	2	3	4	5
MAHARASHTRA	6.65	35.86	57.49	100.00
1. Greater Bombay	1.07	46.39	51.04	100.00
2. Poona	3.05	35.20	61.75	100.00
3. Nagpur	6.05	31.43	62.52	100.00
4. Sholapur	3.65	53.63	42.57	100.00
5. Ulhasnagar	1.43	55.53	43.03	100.00
6. Nasik	7.18	31.05	61.77	100.00
7. Kolhapur	8.93	31.03	59.94	100.00
8. Thana	1.53	53.54	30.93	100.00
9. Sangli	13.59	29.50	56.91	100.00
10. Amravathi	13.82	18.64	67.54	100.00
11. Malegaon	5.94	76.32	17.74	100.00
12. Akola	11.53	23.92	64.55	100.00
13. Aurangabad	5.88	22.24	71.89	100.00
14. Ahmednagar	2.45	21.95	75.59	100.00
15. Dhulia	1.07	45.39	51.04	100.00
16. Nanded	7.76	31.67	60.57	100.00
17. Jalgaon	14.35	17.67	67.93	100.00
18. Bhusawal	6.81	30.50	62.57	100.00
ANDHRA PRADESH	9.38	25.13	65.49	100.00
1. Hyderabad	3.70	22.42	73.88	100.00
2. Vishakapatnam	2.55	24.17	73.11	100.00
3. Vijayawada	4.74	23.92	71.32	100.00
4. Guntur	7.03	36.20	56.67	100.00
5. Warangal	8.33	26.95	64.72	100.00
6. Rajahmundry	7.71	26.20	66.08	100.00
7. Kakinada	6.76	21.54	71.70	100.00
8. Kurnool	14.84	20.27	64.89	100.00
9. Nellore	9.68	21.54	68.77	100.00
10. Eluru	11.31	29.51	59.47	100.00
11. Nizamabad	13.95	27.21	58.93	100.00
12. Machilipatnam	15.11	25.30	59.59	100.00
13. Tenali	16.14	21.49	62.36	100.00

Source : *Maharashtra*: Compiled from Census 1971, Part II-D, Table D-V.
Andhra Pradesh: Compiled from Census 1971, Part II-D, Table D-V.

Table 8.0 : Maharashtra: Distribution of Migrant Workforce into the Metropolitan Settlement in the Broad Activity Group by Place of Origin, 1971

(Per cent)

Metropolitan Settlements	Within the State				Neighbouring States				Non-neighbouring States			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
MAHARASHTRA	7.6	34.6	57.8	100.00	4.0	39.2	56.8	100.00	2.5	31.1	66.4	100.00
1. Bombay	0.9	50.0	49.1	100.00	0.7	42.0	57.3	100.00	1.6	45.2	53.2	100.00
2. Poona	3.9	38.5	57.6	100.00	1.7	39.0	59.3	100.00	0.7	18.5	80.8	100.00
3. Nagpur	7.3	22.5	58.9	100.00	4.5	25.5	69.0	100.00	3.7	25.8	70.5	100.00
4. Sholapur	5.0	30.5	64.5	100.00	1.5	68.3	30.2	100.00	0.7	20.8	78.5	100.00
5. Ulhasnagar	1.3	45.7	53.0	100.00	1.2	56.2	42.6	100.00	2.0	10.0	83.0	100.00
6. Nasik	8.2	32.8	59.0	100.00	3.2	24.4	72.4	100.00	1.4	22.6	76.0	100.00
7. Kolhapur	9.3	30.3	60.4	100.00	8.9	34.1	57.0	100.00	5.0	23.0	72.0	100.00
8. Thana	1.4	55.7	42.7	100.00	1.3	55.1	43.6	100.00	2.1	70.3	27.6	100.00
9. Sangli	12.8	30.0	57.2	100.00	17.2	25.1	57.7	100.00	1.4	55.8	42.8	100.00
10. Amravathi	14.5	18.4	67.1	100.00	6.5	18.6	74.9	100.00	12.6	22.0	65.4	100.00
11. Malegaon	7.3	72.3	20.4	100.00	2.0	84.0	14.0	100.00	0.5	94.0	5.5	100.00
12. Akola	12.8	23.9	63.3	100.00	3.3	23.0	43.7	100.00	4.7	25.1	70.2	100.00
13. Aurangabad	7.6	23.2	69.2	100.00	2.1	17.5	80.4	100.00	0.2	7.3	92.5	100.00
14. Dhulia	8.0	31.1	60.9	100.00	3.2	38.8	53.0	100.00	..	45.6	54.4	100.00
15. Ahmednagar	3.9	28.0	68.1	100.00	..	48.4	51.6	100.00	0.2	1.8	98.0	100.00
16. Nanded	9.5	26.8	63.7	100.00	3.1	46.0	50.9	100.00	1.2	24.4	74.4	100.00
17. Jalgaon	5.3	16.9	67.8	100.00	5.2	24.6	70.2	100.00	4.2	20.0	75.8	100.00
18. Bhusawal	8.2	30.7	61.1	100.00	2.3	30.6	67.1	100.00	1.1	28.1	70.8	100.00

Source : Compiled from Census 1971, Part II-D, Table D-V.

Table 8.1 : Andhra Pradesh : Distribution of Migrant Workforce into the Metropolitan Settlement in the Broad Activity Group by Place of Origin, 1971

(Per cent)

Metropolitan Settlements	Within the State				Neighbouring States				Non-neighbouring States			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
ANDHRA PRADESH	9.9	25.0	65.1	100.00	2.0	27.1	70.9	100.00	1.0	19.5	79.5	100.00
1. Hyderabad	5.8	26.0	68.6	100.00	1.0	21.5	77.5	100.00	0.2	10.6	89.2	100.00
2. Vishakapatnam	3.2	25.6	71.2	100.00	0.2	19.5	80.3	100.00	0.3	21.4	78.3	100.00
3. Vijayawada	3.1	25.3	71.6	100.00	2.7	23.4	73.9	100.00	0.9	12.2	86.9	100.00
4. Eluru	11.0	29.1	59.3	100.00	2.0	37.2	60.8	100.00	2.0	40.0	58.0	100.00
5. Guntur	6.9	36.6	56.5	100.00	0.6	32.2	67.2	100.00	0.4	25.4	74.2	100.00
6. Warangal	8.8	27.3	63.9	100.00	0.7	23.6	75.7	100.00	1.0	36.1	62.9	100.00
7. Rajahmundry	8.2	25.7	66.1	100.00	..	31.0	69.0	100.00	..	36.9	63.1	100.00
8. Kakinada	7.3	17.6	75.1	100.00	3.0	9.0	88.0	100.00	1.2	11.2	87.6	100.00
9. Kurnool	16.9	20.9	62.2	100.00	3.0	33.0	64.0	100.00	1.3	13.0	85.7	100.00
10. Nellore	10.9	19.8	69.3	100.00	3.6	34.5	61.9	100.00	..	11.4	88.6	100.00
11. Nizamabad	12.2	27.1	56.7	100.00	4.6	30.3	65.1	100.00	2.0	17.2	80.8	100.00
12. Machilipatnam	15.7	25.2	59.7	100.00	1.0	31.6	67.4	100.00	..	15.0	85.0	100.00
13. Tenali	16.6	21.5	61.9	100.00	4.6	25.0	70.4	100.00	..	3.6	96.4	100.00

Source: Compiled from Census 1971, Part II-D, Table D-V.

Table 9.0 : Distribution of Migrant Workers into Metropolitan Centres from Rural and Urban Areas, 1971

(Per cent)

Metropolitan Settlements	Total Migrant Workers '000	Rural Migrant Workers	Urban Migrant Workers	Total
1	2	3	4	5
MAHARASHTRA	2,643	64.29	35.71	100.00
1. Greater Bombay	1,675	70.88	29.24	100.00
2. Poona	212	53.91	46.08	100.00
3. Nagpur	130	60.94	39.06	100.00
4. Sholapur	42	68.65	31.35	100.00
5. Ulhasnagar	84	38.67	61.33	100.00
6. Nasik	42	59.17	40.83	100.00
7. Kolhapur	33	67.37	32.65	100.00
8. Thana	59	42.03	57.96	100.00
9. Sangli	31	70.16	29.83	100.00
10. Amravathi	29	65.66	34.35	100.00
11. Malegaon	26	58.56	41.44	100.00
12. Akola	27	54.98	45.02	100.00
13. Aurangabad	24	51.02	48.98	100.00
14. Ahmednagar	24	66.15	33.85	100.00
15. Dhulia	17	88.45	11.53	100.00
16. Nanded	18	66.93	33.07	100.00
17. Jalgaon	17	60.59	39.40	100.00
18. Bhusawal	16	52.22	47.77	100.00
ANDHRA PRADESH	589	73.65	26.35	100.00
1. Hyderabad	173	50.28	49.72	100.00
2. Vishakapatnam	58	54.95	45.05	100.00
3. Vijayawada	66	67.65	32.34	100.00
4. Guntur	51	74.02	25.98	100.00
5. Warangal	19	70.58	29.42	100.00
6. Rajahmundry	31	68.57	31.57	100.00
7. Kakinada	20	65.77	34.22	100.00
8. Kurnool	18	73.00	27.00	100.00
9. Nellore	20	74.06	25.94	100.00
10. Eluru	18	70.43	29.57	100.00
11. Nizamabad	22	68.44	31.56	100.00
12. Machilipatnam	15	74.59	25.41	100.00
13. Tenali	17	76.67	23.34	100.00

Source : *Maharashtra*: Compiled from Census 1971, Part II-D, Table D-V.
Andhra Pradesh: Compiled from Census 1971, Part II-D, Table D-V.

Table 10.0 : Maharashtra : Cumulative Percentage Distribution of Migrants into Metropolitan Settlements by High Level of Education and Services, 1971

Metropolitan Settlements	Metro-politan popula-tion	Total Migrants	Total Literate Migrants	Level of Education			Higher Order Services		
				Graduate Migrants	Post-Graduate Migrants	Technically qualified & Professional Migrants	Professional and Technically related Workers	Administrative & Executive Workers	Production and related workers
1	2	3	4	5	6	7	8	9	10
1. Greater Bombay . .	53.69	59.29	59.82	59.04	59.93	55.03	59.70	52.21	70.16
2. Poona . . .	63.88	69.07	69.95	71.65	72.10	70.08	68.03	75.05	77.46
3. Nagpur . . .	72.25	75.08	75.93	79.14	82.05	77.47	73.59	80.71	82.16
4. Sholapur . . .	73.83	77.20	77.59	80.43	83.07	79.08	75.34	81.41	84.08
5. Ulhasnagar . . .	79.39	80.98	81.58	84.74	85.77	82.58	79.78	82.58	87.65
6. Nasik	81.83	83.27	83.88	86.53	87.13	84.69	82.18	85.20	88.95
7. Kolhapur . . .	84.24	85.09	85.63	88.38	88.82	86.52	84.34	87.20	89.98
8. Thana	86.10	87.61	88.25	91.08	90.71	88.77	86.84	88.18	92.69
9. Sangli	87.92	89.29	89.70	91.97	91.32	89.91	88.64	88.88	93.69
10. Amravathi . . .	89.66	90.91	91.38	93.53	93.81	91.69	90.55	89.33	94.46
11. Malegaon . . .	91.38	92.10	92.11	93.79	93.96	91.98	91.14	89.53	95.88
12. Akola . . .	92.89	93.51	93.51	94.68	95.22	93.74	92.89	89.90	96.67
13. Aurangabad . . .	94.37	94.92	95.00	96.77	97.44	95.69	94.92	92.42	97.20
14. Ahmednagar . . .	95.70	96.08	96.30	97.66	98.05	96.93	96.04	98.90	97.76
15. Dhulia . . .	96.94	97.18	97.37	98.23	98.47	97.59	96.97	91.14	98.33
16. Nanded . . .	98.08	98.10	98.14	98.97	99.03	98.28	98.15	99.47	98.97
17. Jalgaon . . .	99.06	99.07	99·08	99.58	99.69	99.25	99.32	99.83	99.36
18. Bhusawal . . .	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source : Compiled from Census 1971, Part II-D, Table D-III.

Table 10.1: Andhra Pradesh: Cumulative Percentage Distribution of Migrants into Metropolitan Settlements by High Level of Education and Services, 1971

Metropolitan Settlements	Metro-politan popula-tion	Total Migrants	Total Literate Migrants	Level of Education			Higher Order Services		
				Graduate Migrants	Post-Graduate Migrants	Technically qualified & Professional Migrants	Professional & technically related workers	Administrative & executive workers	Production and related workers
1	2	3	4	5	6	7	8	9	10
1. Hyderabad . . .	44.21	29.35	32.76	54.11	55.22	43.86	38.48	71.78	25.23
2. Vishakapatnam . .	53.16	41.15	45.00	65.93	66.20	58.59	49.60	85.04	38.53
3. Vijayawada . . .	61.64	53.86	58.05	72.78	72.57	66.33	59.78	89.05	52.76
4. Guntur . . .	68.29	62.68	66.03	79.06	79.18	73.89	67.53	91.77	65.26
5. Warangal . . .	73.39	66.92	69.37	81.66	82.04	77.65	71.78	92.66	69.32
6. Rajahmundry . .	78.04	73.38	75.29	85.25	85.44	80.73	76.64	93.95	76.67
7. Kakinada . . .	82.08	78.07	80.17	88.62	88.23	85.87	81.24	95.19	80.17
8. Kurnool . . .	85.44	81.41	83.57	90.99	90.23	89.77	85.24	96.08	82.69
9. Nellore . . .	88.73	85.44	87.69	92.92	91.99	91.79	87.93	96.92	86.27
10. Eluru . . .	91.86	89.24	91.29	95.13	94.35	94.35	91.31	97.73	89.94
11. Nizamabad . . .	94.70	92.91	93.36	96.18	93.81	95.63	93.69	98.48	94.44
12. Machilipatnam . .	97.47	96.51	96.91	98.51	94.90	98.86	97.03	99.28	97.09
13. Tenali	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Compiled from Census 1971, Part II-D, Table D-III

THE REGIONAL PATTERN OF URBANISATION AND ECONOMIC DEVELOPMENT IN INDIA

RAKESH MOHAN

Introduction : Some Theoretical Background

Interest in the regional aspects of development has a long and respectable history. Disputes over the causes of, as well as solutions to, the existence of regional disparities have been of at least equally long-standing. Economic development tends to be concentrated in certain geographic regions as development proceeds from low levels of income. Moreover, the most obvious manifestations of concentration appear in those cities which tend to stand out in sharp contrast to their surrounding countryside. Agriculture also is often seen to prosper in certain regions more than in others. The combined effect of such emerging patterns is that disparities are observed, on the one hand, between urban and rural areas and, on the other hand, between regions. If agricultural prosperity is itself accompanied by higher urbanisation, the emerging regional differentials in income and welfare are thus even more clearly related to the differential rates of urbanisation. This paper is then an effort to relate the existing differentials in the levels and rates of urbanisation between States to their levels of economic development.

It is interesting that although concern with inter-regional disparities has been expressed in Indian plan documents for a long time, and that one of the avowed aims of planning is to reduce these disparities, there has been little attempt to relate their existence to differential rates of urbanisation. Most of the concern with urbanisation has to do with the relative rates of growth in large and small cities. The reasons for this neglect are, perhaps, not hard to find, While there are respectable theories linking urbanisation with economic development, others explaining the growth of individual cities (i.e. economc base theory), and yet others explaining the distribution of towns in agricultural regions (e.g., central place theory), there is little available combining these different strands simultaneously. A recent advance in this direction has been made by Koichi Mera (1974) by positing what the terms the "layer" concept of urbanisation.

The tight link between levels of economic development and urbanisation is now well-established and accepted. A logistic equation relating levels of per capita GNP to levels of urbanisation, both measured traditionally, is found to fit international data quite well. Indeed, it is felt that the fit would be even better if there were not the inevitable measurement problems related to the definition of urban areas, which varies between countries as well as the well known problems in the measurement of GNP. It is found that as income increases, urbanisation proceeds slowly in the initial stages, accelerates (in the stage of countries which are now known as middle income countries) and again slows down at very high levels of income. This is found to be largely true for a cross section of countries at any given time and for a time series of a single country over a period of time. The explanation for such a phenomenon can be stated in somewhat different ways. What is required is a framework for the whole economy and the place of urbanisation within it.

Consider an economy with the three traditional economic sectors: agriculture; industry and services. This production structure of these sectors can be modelled through the use of standard production functions. The returns to the factors of production (labour, capital and land), which interact to produce the output through these production functions, can then be attributed to each. Once this is done, the demand arising for each of the three products, given these incomes, can be determined. Such a model can be simulated and the economy made to grow by adding rules of investment and saving. The results of such a model illustrate the typical path followed by an economy undergoing economic development and urbanisation. Agriculture is essentially located in rural areas, with industry and services in urban areas. Initially, at low levels of income, the large majority of the labor force is employed in agriculture producing at subsistence levels. Trade between the urban and rural areas is determined essentially, on the one hand, by the demand for food by the small urban population and, on the other hand, by the small demand for urban goods by the rural population. At low income levels, large proportions of income are spent on food, while only the residual small amounts left are spent on urban goods. As incomes rise, perhaps as a result of technological changes in agriculture, the proportion of income spent on food declines and, consequently, that on other goods increases. This is because, after nutritional needs are satisfied, only small increases can take place in the income spent on food; more technically, this is the familiar Engel effect resulting from the income elasticity of food being less than one. In the initial stages, when the marginal increases in income are still going towards satisfaction of nutritional needs, the increase in demand for nonfood goods is slow. Consequently, the increase in demand for labor to produce the nonfood goods is also slow and hence the rate of urbanisation is slow. As incomes increase, and the proportion of income spent on nonfood goods continues to increase, the absolute demand for nonfood goods accelerates, the demand for labor in urban areas increases, and the rate of urbanisation accelerates as well. At very high income levels, the rate of urbanisation slows down again since there is a logical limit of 100 per cent. The proportion of the labour force necessary to produce the food required for the urban areas approaches an irreducible minimum. This process can only happen when there are continual technologi-

cal changes occurring in agriculture permits continual increases in labour productivity there.

Some caveats and explanations are needed to qualify the above tale. This somewhat elaborate, though perhaps commonsensical, explanation has been given since it is often said that the relationship between urbanisation and economic development is only an observed regularity and not well-based in a theoretical sense. The main question which remains unanswered in such a formulation relates to the reasons why non-agricultural activities are located in urban areas in the first place. This also raises the question, not addressed until now, on what constitutes an urban area. Conceptually, disregarding details and practical problems characteristically encountered in the classification of urban areas by census authorities, the essence of urban areas lies in (i) the size of settlements, (ii) the density of these settlements and (iii) the predominance of non-agricultural activities. An urban area is essentially a settlement of some size with considerable density. The predominance of non-agricultural activities is actually a consequence of factors such as size and density of a settlement. Since agricultural activities are land-intensive it is difficult for a large number of people engaged in agricultural activities to concentrate in one settlement. This is another way of saying that the elasticity of substitution between land and non-land inputs in agriculture is limited, while in industry and services it is high. As a result, industry and service activities tend to be capital-intensive and are therefore concentrated in space which leads to distribution of the urban population which must locate near these activities to service them. These are the second and the third layers. Thus each set of basic activities—primary, secondary and tertiary, have multipliers which determine the resulting urban population. According to this formulation, one has to isolate which of the secondary and tertiary activities are "basic". This is not easy, but, consistent with the idea of economies of scale, large industry can be regarded as basic in the secondary sector. The location of much of large industry is also determined by proximity to raw materials—particularly iron and steel. This is determined by the principle of comparative advantage and may clearly be regarded as basic or exogenous. Similarly, the location of government activity can be regarded as exogenous. The latter is more troublesome, for presumably, the distribution of government activities is itself determined by the location of other activities. To the extent, however, that it is discretionary, it may be regarded as basic or exogenous.

The task then in this paper is to investigate how the regional pattern of urbanisation and economic development in India conforms to this conception of an economy. Specifically, it is sought to relate the variation in urbanisation between states to the variation in income, and subsequently, to explain the variations in urban population to different measures of the employment in basic activities. This is done at this time in particular to understand the pattern of urbanisation that has become apparent from the 1981 Indian Census. It is important to make such an investigation since there is a widespread school of thought which believes that the pattern of urbanisation that exists in the country is highly concentrated and "dysfunctional"[1]. Others allege that the urbanisation that has taken place in the country is in some sense "artificial" and not warranted by the existing structure of the economy. While this paper does not offer normative views on the desirable pattern of urbanisation in India its aim is to document the existing pattern, disaggregated by states, to describe how it has evolved over the past 30 years, and to provide some pointers concerning the determinants of urbanisation. If the pattern is found to be consistent with what might be expected and with what is generally found in other countries, today and historically, it can at least be stated that the pattern observed is not surprising, is quite understandable and is at least warranted. It can still be regarded as undesirable from a normative viewpoint, but it would then also be clear that a change in the pattern would require much stronger policy measures.

The next section will document the record of urbanisation disaggregated by states in India since Independence. It will be the aim of the following section to explain the record documented in this manner, given the theoretical background outlined above.

II. The Regional Pattern of Urban Growth and Economic Development in India the Record since Independence

The release of the provisional population totals of the 1981 Census reveals a significant acceleration in the speed of urbanisation in the country. This is true whether comparison is made with the historical record since the beginning of the century or with what was expected as recently as 1979[2]. The Sixth Five-Year Plan projected the level of urban population to be about 148 million in 1981 and the level of urbanisation to be 22.04 per cent. In fact, the 1981 Census showed that the level was about 156 million (but this number excludes Jammu and Kashmir and Assam, not enumerated at the time of publication of Census results). In another recent paper (Mohan and Pant, 1982), we have documented the fact that India has had a relatively slow but stable rate of growth in its urban population since about 1921 during which the level of urbanisation has inched up slowly from about 11.3 per cent of total population to about 23.7 per cent now. Despite the recent acceleration, it must also be recognised that the rate of growth of urbanisation in India is still one of the slower in the world. A key feature of the Indian settlement pattern which emerged from the analysis was the very stable structure of settlements. While total urban population increased sixfold between 1901 and 1982 the number of settlements increased by only 80 per cent. Thus most of the growth was because of the enlargement of existing towns at every level and not mainly because of the addition

[1]This is well argued by Kundu and Raza (1982) for example.

[2]Census of India, 1971, India, Series 1, *Report of the Expert Committee on Population Projections*, Paper 1 of 1979.

of new towns. This implies that the majority of settlements now classified as towns have exhibited urban characteristics for a very long time. The lack of addition of towns at the bottom end has remained something of a puzzle often remarked on by analysis. Indeed, one result of this growth pattern is that the Indian settlement structure has become increasingly top heavy. The proportion of urban population residing in towns above any cut-off point has risen continuously since the turn of the century. This phenomenon has led many observers to note that larger towns have grown faster than smaller ones. This is simply not true as has been documented in detail in the aforementioned paper. In reality, the increasing proportion of urban population in larger cities has merely been the result of progressive accretion to existing settlements of all sizes which are relatively well spread out spatially. The lack of emergence of new towns or of existing villages acquiring urban characteristics is indeed a matter for concern. To the extent that urbanisation is related to economic development and the distribution of lower settlements is well explained by Central Place Theory, the dearth of new urban settlements must be related to the relatively slow growth of agriculture in many regions of the country, coupled with the fact that settled cultivation has existed in India for a very long time. The latter would suggest a well-distributed pattern of settlements which would get denser only if there were a relatively fast rate of growth in agriculture and consequently in agricultural demand for urban goods and services. This is an eminently researchable issue but is not addressed directly here.

Having stated that the Indian settlement structure has been quite stable, it is necessary to disaggregate the trends in urbanisation, up to at least the state level. The variation in experience between states is surprisingly large and one that seems to be not readily explicable at first sight. *Table 1* gives the level of urbanisation in the major states of India (i.e., those with population greater than 10 million in 1971 except Assam which is yet to be enumerated for the 1982 Census and Kerala). Kerala has not been included here because it poses particular problems in the definition of urban areas. Its overall population density was about 550 people per sq. km. in 1971, the rural density itself being about 480. Apart from those settlements which have an organised local body such as a municipality, corporation, cantonment board or notified town area committee which are classified as urban the Indian census classified settlements as urban if they have—

(i) a minimum population of 5000, and

(ii) a density of at least 400 people per sq.km., and

(iii) at least 75 per cent of the male labour force is in non-agricultural activities.

It turns out that in Kerala, in 1971, about 80 per cent of the rural population lives in villages of over 10,000 population and another 15 per cent in villages in the range of 5000 to 10,000 population. Hence, almost all the settlements would qualify for classification as urban settlements were it not for the additional requirement of 75 per cent of the male labour force being in non-agricultural activities. With such high overall densities it is also not easy to decide on the boundaries of settlements. Kerala has therefore been omitted in this descriptive part of the paper; however, it is included, in the more systematic analysis offered in the next section.

Table 1 gives the level of urbanisation in States according to two definitions. First is the population of

Table 1 : Level[1] of urbanisation in states[2] 1951—1981

State	Population of Ali Towns as % of Total				Population of towns above 20,000 only as % of total			
	1951	1961	1971	1981	1951	1961	1971	1981
1	2	3	4	5	6	7	8	9
Andhra Pradesh	17.41	17.4	19.3	23.3	10.8	13.2	16.0	21.1
Bihar	6.8	8.4	10.0	12.5	4.9	6.5	8.0	10.9
Gujarat	27.2	25.8	28.1	31.1	18.3	20.4	22.5	26.7
Haryana	17.0	17.2	17.7	22.0	10.9	12.5	13.9	18.1
Karnataka	22.9	22.3	24.3	28.9	13.4	15.6	18.2	23.9
Madhya Pradesh	12.0	14.3	16.3	20.3	7.7	9.7	12.2	15.7
Maharashtra	28.8	28.2	31.2	35.0	20.7	23.8	27.7	32.2
Orissa	4.1	6.3	8.4	11.3	2.1	3.5	6.0	9.0
Punjab	21.7	23.1	23.7	27.7	14.5	17.5	18.5	22.4
Rajasthan	24.4	26.7	30.3	33.0	13.0	21.0	26.3	29.9
Tamil Nadu	24.4	26.7	30.3	33.0	13.0	21.0	26.3	29.9
Uttar Pradesh	13.6	12.9	14.0	18.0	9.4	10.6	11.9	13.8
West Bengal	23.8	24.5	24.7	26.5	21.4	22.3	22.9	25.3
India[3]	17.6	18.3	20.2	23.7	12.3	14.5	16.9	20.5

[1]Urban population as proportion of total population.

[2]Including all states with total population greater than 10 million in 1971 but excluding Kerala and Assam.

[3]Including all states except Assam and Jammu and Kashmir.

Source: Tables A.1 and A.2.

all towns as a per cent of the total population and second is the same, but including the population in towns over 20,000 only. The definitional problems referred to above are essentially at the lowest levels. All settlements of 20,000 and over are easily classified as urban. Thus, this avoids kinks in trends due to definitional problems. The most industralised states of Maharashtra, Gujarat and Tamil Nadu are now all over 30 per cent urbanised (according to the Census definition). The industrial stagnation of Calcutta is reflected in the level of urbanisation in the at stable since 1951. These states conform more to middle-income countries with about $500 per capita income in terms of the level of urbanisation. At the other end of the scale are Orissa (11.3%) Bihar (12.5%) and Uttar Pradesh (18.0%). There are only about 10 countries[1] in the world at the lowest per capita levels pressing levels of urbanisation below 12 per cent. Thus, in terms of urbanisation levels, India's regions exhibit patterns spanning the whole range of about 50 countries with annual per capita incomes from about $ 100 to $ 400. The variation in levels of urbanisation[2] has, however, declined as measured by the coefficient of variation, from about 0.45 in 1951, to 0.42 in 1961, 0.50 in 1971 to 0.34 in 1981. The acceleration in the least urbanised states, along with the deceleration of the most urbanised ones, has caused this major change in the last decade.

Table 2 gives the growth rate of urban population in States from 1951 to 1981. As is evident from column 3, all of the relatively poorer states (Andhra Pradesh, Bihar, Madhya Pradesh, Orissa and Uttar Pradesh)[3] have experienced rapid urban growth during 1971 to 1981, while only Haryana among the richer states has experienced comparable growth. In fact, the old industrially developed states of West Bengal, Tamil Nadu and Maharashtra have the lowest growth rates. Naturally, absolute increases in urban population in these states continue to be large due to the higher initial levels. As in Table 1, columns 5 and 7 of Table 2 give comparable growth rates for urban population in towns above 20,000 only. While most of the observations made above are still valid, there are some changes that appear significant. The changes between decades are much less with this definition, presumably because the definition is more consistent between the States. The acceleration between decades is also less pronounced—although the rate of growth for each State is much higher. This result extends the idea that the Indian settlement structure is of longstanding and is also stable at the state level. Thus, the fact that the urbanisation rate for (class III)[4] towns and above is higher than for all towns taken together again points to the fact that most urbanisation is by accretion to existing towns of all sizes, and there are only small additions of new towns at the low end of the range. This now appears to be true at the state level as well. It may, however, be expected that in States such as Orissa, U.P. (particularly Eastern U.P.) and Madhya Pradesh (particularly Eastern Madhya Pradesh), where initial urbanisation levels are low and towns are located sparsely, there would be a greater potential for the emergence of new towns. Indeed, one finds that with the second definition, an acceleration in urbanisation is not apparent in these states, indicating that much of the observed acceleration is because of the emergency of new towns.

Table 2 : Statewise growth of urban population 1951—1981

(Per cent per year)

State	All towns			Towns above 20,000 only		
	1951-61	1961-71	1971-81	1951-61	1961-71	1971-81
1	2	3	4	5	6	7
Andhra Pradesh	1.5	2.9	4.0	3.5	3.9	5.0
Bihar	4.1	3.7	4.4	4.8	4.1	5.4
Gujarat	1.8	3.5	3.5	3.5	3.6	4.2
Haryana	3.1	3.1	4.8	4.4	3.9	5.2
Karnataka	1.7	3.1	4.2	3.5	3.8	5.3
Madhya Pradesh	4.0	3.9	4.6	4.6	5.0	4.8
Maharashtra	2.0	3.5	3.4	3.6	4.0	3.8
Orissa	6.5	5.2	5.3	7.4	7.9	6.0
Punjab	2.6	2.3	3.7	3.9	2.6	4.1
Rajasthan	1.1	3.3	4.6	2.8	4.3	5.4
Tamil Nadu	2.1	3.3	2.5	6.1	4.3	2.9
Uttar Pradesh	0.9	2.7	4.9	2.9	2.9	3.9
West Bengal	3.1	2.5	2.8	3.3	2.7	3.1
India	2.33	3.26	3.85	3.59	3.85	4.18

Notes 1. Including all states with total population greater than 10 million in 1971 but excluding Kerala and Assam.
2. Including all states except Assam, Jammu and Kashmir.

[1]Including Bhutan, Nepal and Bangladesh.
[2]The coefficient of variation in the levels of urbanisation is taken for levels according to urban population in towns above 20,000.
[3]This is documented below.
[4]Towns over 20,000 population.

The problems caused by variation across states in the classification of towns at the low end has already been alluded to. Table 3 indicates the differences caused by the addition of new towns in the 1981 Census. The states which have added a significant number of new towns are essentially Haryana, Madhya Pradesh, Rajasthan, Orissa and Uttar Pradesh. Many of these towns in U.P. should have been classified as such in 1971 (Premi and others, 1977). Thus, the apparent large acceleration of urbanisation in U.P. is at least partly illusory, though not entirely so. Taking the same towns as in 1971 (column 6, Table 3), the growth rate did increase from 2.7 per cent per year in 1961-71 to 3.1 per cent in 1971-81. Similarly, if only towns over 20,000 are considered (column 6, 7, Table 2), the rate increased from 2.9 to 3.9 percent a year. Similarly, for Haryana, the corrected growth rate of 4.1 per cent is still significantly higher than the 3.1 per cent for 1961-71. The conclusion, on the basis of Table 3, then, is that the definitional problems of towns in the 1981 Census to make a difference to the recorded growth rates of 4 or 5 particular states —showing a much larger increase—but do not alter the overall pattern described from the growth rate of urban population, whether it is according to the usual definition or to that for towns above 20,000 population. The population of the added towns, as a proportion of state urban population, was 6 per cent for Haryana 16 per cent for U.P. and 9 per cent for Orissa. At the all India levels then, the difference made by these definitional issues is small. The total population of the towns newly classified as such is only about 5 per

Table 3 : Statewise[1] growth of urban population excluding new towns[2] added in 1981

1971-1981

State	No. of towns 1981	No. of new towns 1981	Total urban population exclud ing new towns 1981 ('000)	Annual growth rate	
				Uncorrected (per cent per year 1971-81)	Corrected
1	2	3	4	5	6
Andhra Pradesh	234	29(2)	12,160	4.0	3.8
Bihar	179	30(4)	8,374	4.4	4.1
Gujarat	220	29(2)	10,289	3.5	3.4
Haryana	79	17(6)	2,641	4.8	4.1
Karnataka	250	34(4)	10,389	3.5	3.4
Madhya Pradesh	303	72(6)	9,956	4.6	3.9
Maharashtra	276	31(2)	21,616	3.4	3.2
Orissa	103	27(9)	2,836	5.3	4.4
Punjab	134	28(4)	4,419	3.7	3.2
Rajasthan	195	43(7)	6,612	4.6	3.8
Tamil Nadu	245	18(1)	15,774	2.5	2.5
Uttar Pradesh	659	368(16)	16,829	4.9	3.1
West Bengal	130	19(1)	14,236	2.8	2.7
India[4]	3,007	770(5)	136,169	3.81	3.35

Note : [1]All states with 1971 population of 10 million and above.

[2]No. of towns added in 1981, i.e., towns not classified as such in 1971 (including those classified as towns in an earlier census but not in 1971).

[3]Figures in brackets give the population of new towns as a percentage of total urban population.

[4]Including only the 13 states above.

[5]Rate of growth of total urban population in States.

[6]Rate of growth of urban population in state but excluding new towns in 1981 and excluding 1971 towns not found in 1981 Census as detailed in Appendix 2.1.

Source: 1. Census of India 1981 Series I, India Paper 2 of 1981.

2. Census of India 1971 Series I, India Part II-A(i) General Population Tables Statement 5, page 185.

cent of the total. For some of these which should have been classified as towns for the first time in this Census, this should not be regarded as an error. The "error" is caused by those towns, mostly in U.P., which should have been classified as towns in the 1971 Census itself.

Table 4 which gives the rates of growth of rural population, is of further interest. There have been significant declines in the rate of growth of rural population in the high agricultural productivity states of Haryana and Punjab, but small increases have taken place in the low productivity states of Bihar, Rajasthan and U.P. There have, however, been declines in other poor states such as Orissa and Madhya Pradesh. Preliminary census results indicate that for the first time since the turn of the century, there may have been a perceptible decline in the proportion of the labour force engaged in agriculture—from 69.8 per cent in 1971 to 66.7 per cent in 1981 (J. N. Sinha, 1982). This is at least consistent with the decline in the overall rate of rural population growth. Increases in agricultural production are now coming mainly from productivity

changes—only small increases in cropped area can now be detected. There are therefore indications that the absorptive capacity of agriculture for continued increases in population and labour force is now declining.

Table 4 : Statewise[1] growth of rural population in India 1951—1981

State	Annual Rate of Growth of Rural Population (per cent per year)		
	1951-61	1961—71	1971—81
1	2	3	4
Andhra Pradesh	1.46	1.68	1.60
Bihar	1.64	1.78	1.89
Gujarat	2.61	2.29	2.00
Haryana	2.93	2.78	1.96
Karnataka	2.06	1.93	1.73
Madhya Pradesh	1.92	2.31	1.77
Maharashtra	2.2	2.03	1.43
Orissa	1.58	2.03	1.43
Punjab	1.79	1.89	1.55
Rajasthan	2.63	2.32	2.42
Tamil Nadu	0.81	1.53	1.20
Uttar Pradesh	1.65	1.68	1.81
West Bengal	2.80	2.37	1.85
India[2]	1.89	2.00	1.75

[1]Including all states with a population of 10 million or more in 1971 excluding Kerala and Assam.

[2]Including all states except Assam and Jammu and Kashmir.

Table 5 tabulates the urban-rural growth differential (U.R.G.D.)—yet another index of urbanisation. This is merely the difference between the urban and rural population growth rates. The acceleration in urbanisation is even more evident from this table—since urban population growth rates have increased in general, while rural growth rates have declined. Again, it is only Tamil Nadu which shows a decline; there have been significant increases which have occurred in all other states. The progress over the three decades is quite remarkable. There were as many as 5 States with negative URGD, only one with less than 1.0, and as many as 9 with over 2.0. The rural urban transformation and its acceleration in all the States therefore stands out with much greater clarity by considering URGD.

Table 5 : Urban-Rural Growth differential (URGD) by States 1951-1981

State	URGD[3]		
	1951-61	1961-71	1971-81
1	1	3	4
Andhra Pradesh	0.01	1.28	2.42
Bihar	2.43	1.93	2.55
Gujarat	—0.76	1.21	1.48
Haryana	0.12	0.31	2.80
Karnataka	—0.37	1.13	2.44
Madhya Pradesh	2.06	1.59	2.78
Maharashtra	—0.27	1.45	1.79
Orissa	4.87	3.19	3.91
Punjab	0.79	0.39	2.14
Rajasthan	—1.58	0.99	2.20
Tamil Nadu	1.25	1.79	1.28
Uttar Pradesh	0.70	1.03	3.08
West Bengal	0.32	0.16	0.93
India[2]	0.48	1.29	2.11

[1]Including all states with a population of 10 million or more in 1971 but excluding Kerala and Assam.

[2]Including all states except Assam and Jammu and Kashmir.

[3]Taken as the difierence between the growth rate of total urban population (census definition) and rural population growth rates

It is interesting to find that the distribution of population growth rates for rural as well as urban areas has tended to become more uniform between states over the same period. The coefficient of variation between states of rural population growth rates has declined from 0.36 for the 1951-61 period to 0.17 for 1961-71 to 0.16 for 1971-81. The corresponding coefficients for urban population growth are 0.31, 0.31 and 0.20, respectively.[1] Furthermore, the pattern is confirmed if taken back to the 1941-51 decade. The coefficient of variation for rural population growth rates for that decade was about 0.49, and for urban population growth rates was about 0.31 again. What is of great interest is that the variation in urban population growth rates has declined as well in the past decade.

It may be somewhat premature to draw strong conclusions from the decline in one decade of this one inequality measure—the coefficient of variation—after it had been stable for 3 previous decades. Firstly, this decline is presumably a result of the lower variation across states in total population growth rates. But it may also be a result of the dispersal of industrialisation that has taken place between states—although this is still of small magnitude. Sekhar (1983) has documented the decline in the index (the Theil Index) of inequality between states in organised industry over the last 2 decades—whether measured by value added or employment. It must be emphasised that the changes have been small; as late as 1976, Maharashtra, West Bengal, Gujarat and Tamil Nadu together accounted for about 55 per cent of all value added and 52 per cent of all employment in the manufacturing (factory) sector. In 1961, in comparison, these four states accounted for as much as 66 per cent of valued added and 58 per cent of employment. Given this small change, not much can be made of the decline in variation of the rate of urbanisation—only that two results are at least consistent with each other.

[1]These coefficeints of variation for urban population growth are calculated for the growth of towns above 20,000 only (Columns 6, 7 in Table 2) to avoid the variations due to low and definitional problems.

How can all these data be summarised? Table 6 groups all of the states into four categories. The variation in the experience of the different groups of states is immediately apparent. Thus, even in the case of richer states, two patterns that are diametrically opposite are revealed. Thus, in the old industrially and commercially developed states of Maharashtra and Gujarat, the urban growth rate increased initially, but tapered off thereafter, while in the agriculturally progressive developed states of Punjab and Haryana, the opposite was experienced. Clearly different forces are at work in these States, and more detailed analysis is required before further generalisation can be made.

Table 6 : Urban growth in states during 1951—1981

Category of states	All towns	Towns of population above 20,000 only
1	2	3
I. States where the rate of growth of urban population has increased continuously since 1951-61.	Andhra, Karnataka Rajasthan and Uttar Pradesh.	Andhra, Gujarat Karnataka and Rajasthan.
II. States where the rate increased between 1951-61 and 1961-71 but declined or remained constant thereafter.	Gujarat, Maharashtra and Tamil Nadu	Madhya Pradesh, Maharashtra and Orissa.
III. States where the rate declined or remained constant between 1951-61 and 1961-71 but increased thereafter.	Bihar, Haryana, Madhya Pradesh, Orissa, Punjab and West Bengal	Bihar, Haryana, Punjab, Uttar Pradesh and West Bengal.
IV. States where the rate of growth of urban population has increased continuously since 1951.	None	Tamil Nadu

Source : Table 2.

Having examined the record of urbanisation, it is now necessary to look at different indices of economic development over the same period. Consistent data sources are, however, difficult to obtain for 1951 because of the reorganisation of States in 1956. Hence, only the record since 1961 is presented. Considerable controversy surrounds the magnitudes of per capita state product. Given a countrywide common market it is difficult to compute state domestic product. However, State Statistical Bureaus as well as the Central Statistical Office (CSO) make annual estimates of the state domestic product (SDP). There are usually discrepancies between the two sets of estimates, and the CSO issues a set of consistent estimates with some lag. These are currently available for the period 1970-71 to 1975-76. More difficult still is a constant price series of SDP, and no official series has been issued. The data used here is from a compilation of data by the Centre for Monitoring the Indian Economy, an independent organisation. While recognising that individual errors might exist in this data, it is considered adequate for the purpose at hand : it does give a good picture of the magnitude and pattern of disparity in incomes between states and how this pattern has evolved over the past 20 years.

Table 7(1) gives estimates of per capita SDP at constant 1970-71 prices for 1961, 1971 and 1978-79 the latest data available for a "normal" year. The coefficient of variation (CV) for per capita income has moved from 0.23 in 1961 to 0.26 in 1971 to 0.33 in 1979. This is in the opposite direction from the CV for level of urbanisation which are 0.37, 0.34 and 0.29 for the same years respectively. The ratio of the per capita SDP of the richest to the poorest state was about 2 in 1961, 2.5 in 1971 and 3 in 1981. By international standards these are not high numbers but obviously a matter of some concern that spatial disparities are getting worse in the country.

Table 7(1) : Some selected indicators of economic development

State	Per capita state NDP (constant 1970-71 prices)			Value added in factory sector (current Rs. per capita)		
	1961	1971	1981	1961	1971	1981
Andhra Pradesh	518	586	678	9	29	74
Bihar	390	418	438	14	31	57
Gujarat	697	845	884	52	108	245
Haryana	627	932	1,029	..	70	169
Karnataka	559	675	723	14	62	107
Madhya Pradesh	472	489	463	8	27	68
Maharashtra	769	811	1,008	69	167	324
Orissa	392	541	514	6	27	62
Punjab	760	1,067	1,308	4	52	136
Rajasthan	500	629	591	5	26	56
Tamil Nadu	571	616	582	24	75	166
Uttar Pradesh	457	493	527	9	24	47
West Bengal	758	729	465	50	97	173
Mean	558	676	727	23	60	127
Coefficient of variation	0.23	0.26	0.33	0.92	0.67	0.62

Note : [1]1978-79 data.
[2]1971-78 data.

It is useful to get an idea of regional disparities in other countries to get a better perspective on our own. For example, the CV for Argentina was 0.59, Brazil 0.58, Phillippines 0.75 and Thailand 0.50, in the early to late sixties.[1] The average (unweighted) for 15 less developed countries tabulated was 0.48. the ratio of the poorest to richest regions was about 12 in Indonesia, 9 in Brazil and 5 in Colombia. By these standards, the income disparity between states is very low in India but what may be a matter of deep concern is the worsening of the disparity over time. This has been well appreciated in Indian planning and preferential allocation of funds to the poorer states has been incorporated for some time. Furthermore, there is an elaborate system of incentives for industries to locate in the poorer regions of the country.

Table 7(1) also presents data on the per capita value added in the factory sector. Note that these data are in current prices. The CV has declined from 0.92 in 1961 to 0.67 in 1971, and finally to 0.62 in 1978. The ratio from the highest to the lowest was about 14 in 1961, and 7 in 1971 and 1978 (there being a small decline between the latter two years). It is clear then that the worsening disparity in state incomes has not been caused by the manufacturing factory sector—indeed, there has been a strong opposite trend toward equalisation in this sector. The poorest 3 States in 1961 were Bihar, Orissa and Uttar Pradesh, in terms of income. They also had, along with Andhra Pradesh, Madhya Pradesh and Rajasthan, the lowest value added per capita in the factory sector. The position has not changed much in 1981 and these three states remain among the bottom five or six according to both of the indicators. The rates of increase in the factory sector's value added have, however, been higher in the poorer states. It is quite noticeable from the factory sector valued added table that from a situation when the only substantial manufacturing was in Gujarat, Maharashtra, West Bengal and Tamil Nadu, and located around their capital cities, there has been a considerable dispersal of industry by now.

The first panel in Table 7(2) gives the data on agricultural productivity. This has been defined as the total production of foodgrains per male agricultural laborer. Only male labor has been used because of the well known definitional changes in the 1971 Census which has made the female agricultural labor data noncomparable with other years. The data for males is believed to cause fewer problems. The increase in disparity—CV increasing from 0.30 in 1961, to 0.59 in 1971 and 0.73 in 1981—is quite striking, and consistent with the increasing income disparity. The stagnation in agricultural productivity in the whole Eastern Region is the main cause of the increasing inequality. Productivity has actually decreased or remained almost constant in Bihar, Orissa, West Bengal, Madhya Pradesh and Uttar Pradesh. The data for 1981 is somewhat on the low side because the extremely bad year of 1979-80 has been included in the computed average. The correlative picture would, however, not change much.

Table 7(2) : Some selected indicators of economic development

State	Agricultural Productivity[5] (tons per person)			Power consumption per capita (KWH)		
	1961[1]	1971[2]	1981[3]	1961	1971	1981[4]
1	2	3	4	5	6	7
Andhra Pradesh	0.88	0.83	1.06	20	56	93
Bihar	0.71	0.69	0.67	23	65	87
Gujarat	0.59	0.94	0.85	55	138	231
Haryana	..	2.77	2.91	..	98	211
Karnataka	0.82	1.06	1.13	41	104	149
Madhya Pradesh	1.24	1.26	0.98	16	54	96
Maharashtra	0.92	0.65	1.17	78	158	230
Orissa	0.98	0.96	0.98	32	95	115
Punjab	1.73[6]	3.07	4.36	70[6]	159	303
Rajasthan	1.10	1.44	1.05	3	50	93
Tamil Nadu	0.90	0.98	1.07	58	130	148
Uttar Pradesh	0.85	0.99	0.99	14	60	88
West Bengal	0.92	1.11	1.04	75	118	118
Mean	0.94	1.23	1.35	40	97	150
Coefficient of variation	0.30	0.59	0.73	0.61	0.38	0.45

[1]Average of 159-60 to 1961-62.
[2]Average of 1970-71 and 1971-72.
[3]Average of 1978-79 to 1980-81.
[4]1978-79 data.
[5]Defined as total foodgrains output in the State divided by total male agricultural labour.
[6]Undivided Punjab.

[1]From Gugler and Gilbert (1982).

The next panel gives another useful indicator, the power consumption per capita. It is clear that there have been large overall increases in power consumption in all states. The CV declined from 0.61 in 1961 to 0.38 in 1971, but then increased again in 1981. Note the very high increases in Punjab and Haryana. Consistent with industrial as well as agricultural stagnation of West Bengal, it is the only state which does not record an increase in per capita consumption of power.

Table 7(3) gives two more indicators—the male agricultural employment and total factory employment—as percentages of their respective totals. There has been a clear decline in percentage male agricultural employment, in all states except Tamil Nadu and U.P., between 1961 and 1981. There was a general increase between 1961 and 1971, possibly because of definitional problems. On the other hand, except for West Bengal, and as might be expected, the proportion of people employed in the factory sector has increased between 1961 and 1981 in all the states.

All of these results are quite consistent with some of the conjectures offered for the observed pattern of urbanisation. The decrease in disparity in the manufacturing factory sector—both in terms of value added as well as in employment—would lead to more uniform urbanisation, since almost all factories would be found in urban areas. To the extent that factory employment has large multipliers for service, small manufacturing, and government, its effect on urbanization would be reinforced. The decrease in the proportion employed in agriculture (a very significant decrease by Indian historical standards), accompanied by stagnation in agricultural productivity, suggests the "push" factor operating in the poorer states. This is particularly so since, despite the decrease in agricultural employment (proportionally), it has been pointed out that foodgrain output per male agricultural labourer has declined or remained constant in the poorer states. Although there is a significant increase in the labour employed in factories in these states, they do not appear large enough to *cause* the decrease in agricultural employment.

The composite picture that emerges then is as follows. There has been a perceptible increase in interstate inequality as measured by per capita state domestic product. This has been caused largely by the stagnation in agricultural productivity in the whole Eastern, Central-Eastern and South Eastern Regions. There *have* been notable increases in factory production in all states and particularly so, in relative terms, in the hitherto backward states. This movement has somewhat mitigated the increasing interstate inequality but the favourable changes have not been large enough to counteract the adverse changes in agriculture. The combination of increased manufacturing production and agricultural stagnation in the poorer states (during the last decade) is likely to have caused the significant acceleration in urbanisation over this period. The data suggests that the absorptive power of agriculture has probably been stretched to its limit in the sense that minimum per capita subsistence limits may have been reached. In the earlier periods, there was considerable scope for an extensive increase in the area under cultivation. It was, therefore, possible to accommodate the increase in population and, consequently, the resultant growth in agricultural labor, for cultivation of hitherto uncultivated land. These possibilities have now been exhausted. Increases in agricultural productions can now only take place by productivity changes, i.e., technological change. This seems very clear for the whole rice region; if there is labour using productivity change there will be an initial increase in labour absorption. The indications from Punjab and Haryana are that after the initial labour absorption occurs, after income increases have taken place, and agriculture becomes more technologically intensive, it is likely that urbanisation would again accelerate. The indications therefore are that both agricultural stagnation, as well as growth, are likely to contribute toward further urbanisation in the country in the foreseeable future.

Table 7(3) : Some selected indicators of economic development[3]

State	% Male agricultural employment[1]			% Total factory employment[2]		
	1961	1971	1981	1961	1971	1981
1	2	3	4	5	6	7
Andhra Pradesh	67	69	63	1.2	1.5	2.3
Bihar	78	82	78	1.0	1.6	1.8
Gujarat	63	65	57	4.3	5.3	5.8
Haryana	..	67	50	..	3.5	4.5
Karnataka	69	59	52	1.6	2.8	3.6
Madhya Pradesh	77	78	72	1.0	1.5	1.7
Maharashtra	62	60	52	4.4	5.7	4.9
Orissa	77	80	74	0.5	1.0	1.0
Punjab	61[3]	65	60	1.9[3]	3.0	3.9
Rajasthan	74	75	67	0.6	1.1	1.8
Tamil Nadu	59	61	64	2.3	3.1	3.3
Uttar Pradesh	73	77	74	1.2	1.5	1.7
West Bengal	58	61	56	6.4	6.8	5.7
Mean	66.5	68.8	62.7	2.25	2.99	3.31
Coefficient of variation	0.16	0.12	0.16	0.76	0.59	0.47

[1]Total male agricultural employment as percentage of total male employment.
[2]Total factory employment as percentage of total employment.
[3]For undivided Punjab.

III. The Determinants of Urbanisation : Some Explorations

3.1 *The Level of Urbanisation*

As mentioned in the introduction, the relationship between urbanisation and per capita income has been a long-established one for international cross-section and time series data. The hypothesis is that the shape of the relationship is logistic as expressed by an equation of the type where U is the per cent of population urbanised and Y is per capita GNP. Good fits are generally found for such an equation.

$$U = \frac{a}{1 + b \exp -c \log y} \qquad (1)$$

The most recent estimation of this type has been by Mills and Becker (1982) who have estimated a variant of (1). They have added a variable measuring the level of agricultural activity—the share of the labor force in agriculture. An alternative, to include a measure of manufacturing activity, was found to be a better predictor of urbanisation in such a formulation. They estimated a logistic form of the equation along with a quadratic one of the form:

$$U = a_0 + a_1 Y + a_2 Y^2 + a_3 A + a_4 t \ldots\ldots (2)$$

Where A is the share in agricultural employment and t is a time trend.

If $a_2 > 0$ and $a_3 < 0$

this equation predicts U to start declining after some maximum for a constant A. They found both these formulations to perform quite well with a large international data set spanning the 1960 to 1980 period. The level of explanation achieved (R^2) was about 0.77, i.e., as simple a formulation as this was found to account for 77% of the variance in urbanisation levels in the world.

I utilize a similar framework for attempting to explain the variance in urbanisation between states in India. Consistent data are now largely available, as shown in the last section for 1961, 1971 and 1981. Except for population data, most of the other data is not available yet for 1981, e.g., for SDP, agricultural production, etc. In each case, the nearest available year has been used. Equations such as (1) and (2) are justified using the same kind of theoretical bases given in Section I. They are neither structural nor reduced form equations. Such variable as per capita income urbanisation levels, share of agricultural employment, are all endogenous, resulting from the kind of interactions sketched earlier. But the confirmation of the associations predicted do give some support to the theory.

I estimated the following three types of equations:

$$U = a_0 + a_1 Y^2 + a_2 + a_3 A + a_4 t \qquad (3)$$

or $$U = b_0 + b_1 Y + b_2 Y^2 + b_3 M + b_4 t \qquad (4)$$

or $$U = c_0 + c_1 Y + c_2 Y^2 + c_3 A + c_4 M + c_5 t \qquad (5)$$

where U=level of urbanisation in the State
Y=per capita state domestic product
A=an index of agricultural activity
M=an index of manufacturing activity
and t=time trend.

The exact definition of the variables used is given in Table 8.

A measure of state domestic product per capita (SDP) at constant prices is used for Y; the share of male agricultural employment in total male employment (%LAGRM) and agricultural laborer productivity (FGNS) expressed as total foodgrain production per agricultural labor are used as alternative measures for A. The share of factory employment, value added per capita in the factory sector and per capita power consumption are the alternative measures for M.

Table 8 : Definition of variables

Dependent variables	
1. URB	Level of urbanisation (total urban population as a proportion of total population).
2. URBPOP	Total urban population (in thousands of persons).
3. CLASS I	Total population of class I cities (in thousands of persons) i.e., cities under 100,000 population.
4. NONCLASS I	Total population of nonclass I cities (in thousands of persons) i.e., cities under 100,000 population.
Independent variables	
A. *Income variables*	
1. SDP	State domestic product per capita (in 1970-71 constant prices). 1978-79 data used for 1981.
2. SDP^2	$(SDP)^2$
B. *Employment variables* (all measured in thousands of persons)	
3. LFACT	Total employment in factories (all factories using power and employing more than 10 people and others employing more than 20 people). 1979 data used for 1981
4. LAGRM	Total male employment in agriculture.
5. LMNHM	Total male employment in nonhousehold industries. (no 1981 data).
6. LFACMX	Total employment in factories in "net export manufacturing activities". LFACIT: (S) $LFACT_1$ —min. · · ——————— (total employment :) total employment
7. LGOCT	Total employment in Central government. (This does not include "productive" enterprises, i.e., public enterprises). 1980 data used for 1981.

8. LGOST . Total employment in State government. 1980 data used for 1981.

9. % LFACT . LFACT as percentage of total male employment in the State.

10. % LAGRM . LAGRM as percentage of total male employment in the State.

C. *Other indicators of Economic Developments*

11. VAFAC . Value added per capita in factory sector in the State (current Rs. per person). 1977-78 data used for 1981.

12. KWH . . Total power consumed per capita in the State (KWH/person), 1978-79 data used for 1981.

13. FGNS . Total foodgrains output per male agricultural labor in the State (tons per person).

$$\left(\frac{\text{total food grains output}}{\text{LAGRM}}\right)$$

D. *Other*

14. t Time variable. 1961=1, 1971=2, 1981=3.

[1]This is defined as the excess employment in manufcturing over that required for domestic services. This minimum is approximated by the lowest proportion found among the sample of states.

Note: See Appendix for sources of data.

Table 9(a) gives the regression results estimated by ordinary least squares. Variables are added in a stepwise fashion to test for the stability of individual variables. The coefficients for SDP and $(SDP)^2$ are highly significant and have the predicted signs. The time trend does not add to the level of explanation. This suggests that there is no built-in trend towards urbanisation over time. It argues against those who claim that much of the urbanisation taking place is merely because of population pressure and is unrelated to economic growth. The consistently insignificant coefficient of *t* suggests that with stagnating income one would not expect increasing urbanisation over time. Regressions (3) and (4) suffer somewhat from collinearity problems: %LFACT has a correlation coefficient of about 0.66 with SDP and of about —0.7 with LAGRM. Nonetheless, the coefficient of %LFACT (1.06) in regression (3) is significant at the 5% level. Ceteris paribus, i.e., keeping income constant, a one per cent increase in the share of factory employment would lead to a one per cent increase in the level of urbanisation. The coefficient of LAGRM has the expected negative sign—an increase in the share of agricultural employment would lead to a small decrease in urbanisation.

Table 9(a) : Urbanisation and economic development in Indian States 1961-1981 (1)

Dependent variable : URC (Level of urbanisation)

Independent variables	1	2	3	4	5
Constant	—24.30 (1.69)	—25.11 (1.72)	—17.23 (0.97)	—7.80 (0.41)	—13.92 (0.98)
SDP	0.108 (5.43)	0.107 (5.34)	0.081 (3.29)	0.079 (3.20)	0.083 (4.25)
SDP^2	—0.000055 (4.29)	—0.000055 (4.27)	—0.000043 (2.86)	—0.000040 (2.77)	—0.000044 (3.73)
%LFACT			1.06 (1.71)	0.672 (1.07)	
%LAGRM				— 0.112 (1.07)	
VAFAC					0.049 (3.16)
KWH					
FGNS					
t		0.72 (0.77)	0.65 (0.72)	0.67 (0.74)	—1.14 (1.11)
R^2	0.631	0.637	0.664	0.675	0.716
R2 (Adjusted R^2)	0·612	0.608	0.627	0.629	0.684

Notes : 1. All regressions run with 41 observations. 13 states in 1961 and 14 each in 1971 and 1981. (Punjab and Haryana combined in 1961).

2. t Statistics in parenthesis.

Table 9(b): Urbanisation and Economic Development in Indian States, 1961-1981/ (2)

Dependent variable : URB (Level of Urbanisation)

Independent variables	6	7	8	9	10
Constant	—19.85 (1.49)	—4.28 (0.27)	—6.47 (0.42)	—5.06	—3.70 —(0·21)
SDP	0.103 (5.80)	0.075 (3.64)	0.090 (4.73)	0.079 (3.71)	0.069 (3.16)
SDP^2	—0.000065 (5.61)	—0.000040 (3.24)	—0.000058 (4.68)	—0.000043 (2.50)	—0.000031 (1.85)
%LFACT					
%LAGRM		—0.098 (1.14)	—0.125 (1.55)	0.087 (1.01)	—0.075 (0.83)
VAFAC		0.044 (2.74)			0.031 (1.45)
KWH	0.093 (3.47)		0.087 (3·28)	0.071 (3.27)	
FGNS				—2.34 (1.19)	—2.17 (0.89)
	—2.72 (2.12)	—0.96 (0.93)	—2.52 (1.99)	—1.97 (1.47)	—0.54 (0.48)
R^2	0.728	0.726	0.746	0.756	0.732
R2	0.698	0.687	0.709	0.713	0.685

Notes: *See* Table 9 (a).

The output variables for M perform somewhat better. The coefficient of VAFAC (the value added per capita in the factory sector) is highly significant (regressions 5 and 7) and adds considerably to the magnitude of variance explained, despite its correlation with SDP (0.65). The other proxy for M, power consumption per capita (KWH), has coefficients which are also highly significant and stable (regressions 6, 8, 9). Finally, the last variable utilised, FGNS (agricultural labour productivity), has a negative sign, but is not found to be statistically significant. It does indicate that, ceteris paribus, higher agricultural labor productivity would tend to decrease urbanisation.

It is of interest to analyse the implications of these regressions a bit further. The R^2S obtained are gratifyingly high—in the range of 0.75. These equations succeed in explaining as much as 75% of the variance in urbanisation between states. Furthermore, if the definition of urban population is taken to include only towns above 20,000 population, and the dependent variable URB is changed accordingly, it is found that the R^2 increases to about 0.82. This is presumably because, as was suggested in the last section, the definitional problems at the lower end of the settlement scale are thereby eliminated. Consequently, the variation between states and over time due to inconsistent definition is eliminated. One interesting feature of these estimates is that the maximum positive effect of income on urbanisation is reached at relatively low income levels and is in fact within the sample. The maximum effect is reached in the range of about Rs. 750 to 950 per capita income (1970-71 prices) in different regressions. In international data, this turning point naturally comes at much higher incomes. The reason is essentially that this is a ceteris paribus result: if the share of agricultural employment or factory employment remains constant, this is actually what would happen. This can be illustrated with reference to Punjab. Punjab now has the highest SDP, but its urbanisation level of 27.7 per cent is only the fifth among States. Increases in income without accompanying declines in agricultural employment or increases in manufacturing employment tend to keep the level of urbanisation down. The interconnected simultaneous processes sketched in Section 1 are therefore being captured well in these equations. It is admitted that it is somewhat tautological to say that without a decline in agricultural employment urbanisation will not increase. But *when* does this happen? This occurs in two kinds of situations. First, when income increases only in the urban sector, that is, in a highly dualistic economy, without matching changes in the subsistence agricultural sector. Second, when income increases in the agricultural sector because of labour-using technological changes—perhaps as in Punjab. But both scenarios have their limits. When urban/rural income disparities become too great, migration is induced, but the employment problem remains unless labour utilizing urban technologies are found. Similarly, as may be happening in the Punjab, as agricultural incomes increase further and the demand for urban goods increases, increased demand for urban labour would tend to take labour from rural areas which would in turn have the effect of quicker introduction of labor-saving technology in agriculture. The results from the equations estimated would be consistent with these kinds of changes in the economy.

Further insight is gained by comparing the fitted values with the actual levels of urbanisation. To the extent that the estimations reflect some "norm", the errors in prediction reflect "under" or "over"-urbanisation. Consider the case of the poorer states first, which have been found to urbanise relatively rapidly in the past decade. Bihar and Orissa are found to be consistently "under"-urbanised, i.e., they are expected to be more urbanised than they actually are. But

this gap has been consistently reduced over the last 20 years, particularly in the last decade. This presumably reflects the highly capital-intensive nature of the industries in those states—given their income levels, albeit low, higher levels of urbanisation would have been expected. To the extent that the nature of industry has not changed over this period, and that this has been accompanied by agricultural stagnation, it would be valid to infer that this catch-up phenomenon has been of the push migration variety. It was documented in Mohan and Pant (1982) that this increased urbanisation rate in these states is largely accounted for by very high growth in urban population in the regions which have received the most industry. These, however, are still quite concentrated—in the Southern Region of Bihar, for example—so that the expected level of urbanisation is still higher than the actual, even after accounting for the rapid urbanisation of the past decade. Among the other poor states, U.P. is close to the predicted value in all years when small towns with less than 20,000 population are excluded. But if the total urban population is used, the 1981 actual value is much higher than predicted, implying "over"-urbanisation. This suggests that the acceleration in urbanisation in U.P. is essentially due to definitional changes, as was found in the last section. Otherwise, U.P. gives no cause for surprise. Madhya Pradesh was close to the predicted value in 1961 but has "over"-urbanised considerably over the past two decades. This is true even if small towns are excluded, and is therefore not a definitional problem. Given that industrial investment there has been concentrated in the Eastern region of the state, this result again suggests "push" from rural areas of Madhya Pradesh also.

Among the other states, Kerala is consistently "under"-urbanised—this may be because of the definitional problems alluded to earlier. Haryana is also "under"-urbanised, though less so in 1981—this is consistent with the productivity gains made there in agriculture and which have been labor using. Urbanisation is, however, catching up, because of continuing income increases. The rest of the states—Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan and West Bengal may be termed "normal" in that their predicted and actual values are quite close in all three years.

3.2 *Urban Population : Employment Multipliers*

Having established that the pattern of interstate variation in overall urbanisation found in India is quite consistent with a simple formulation of the relationship between urbanisation and economic development, it is now necessary to elaborate this further by attempting to find the determinants of the absolute levels of urban population found. The methodology adopted is essentially that of Mera (1975), who has suggested a "layer" theory of urbanisation, as outlined in Section I. The idea is to relate the magnitude of urban population to categories of basic employment, i.e.,

$$U_1 = d_1P + d_2S + d_3T \qquad (6)$$

where U_1 is urban population, and P, S and T represent basic employment in the primary, secondary and tertiary sectors respectively. In this formulation, d_1, d_2 and d_3 are the population multipliers resulting from basic employment.

This formulation brings into focus a neglected aspect of urbanisation until now: the role of the tertiary or service sector in the generation of urban employment and population. The justification for this neglect is essentially the idea that all tertiary sector employment is derived from the demands of agricultural and manufacturing activities. This assumption is now relaxed and the tertiary sector can now have at least some component of "basic" employment.

Equation (6) merely says that each type of basic employment adds a layer to urban population, which are additive. Interactions between P, S and T are ignored, by definition, since they constitute "basic" or "export-based" or "exogenous" employment. In the primary sector all male agricultural employment is regarded as basic employment. Two variables are used for each of the secondary and tertiary sectors. LFACT is total employment in the factory sector. This may be regarded as exogenous, since this is employment in only the larger factories, defined as those employing more than 10 employees, if using power, and more than 20, if not using power. These cut-off points are, in reality, quite low: it would be more correct to use higher cut-off points, on the argument that it is the larger factories which exhibit economies of scale and are therefore "more exogenous". Mera suggests construction of another variable to get around this problem. The objective is to purge LFACT of that factory employment which is not basic, i.e., that which is derived. If it is assumed that the State which has the lowest proportion of LFACT has only derived factory employment, this proportion would be necessary in all the other States for local consumption purposes. The excess over this proportion then comprises "basic" or "export" employment (LFACMX) in all other States. For the tertiary sector, government employment is regarded as basic and the two measures used are State Government employees and Central Government employees.

Three different measures of urban population are used as the dependent variable in order to investigate the functions of different sizes of cities. First is URBPOP, the total urban population; second is CLASS-I which is the population of cities over 100,000 only; and the third is NONCLASS-I, which is merely (URBPOP—CLASS-I), i.e., the total population of small towns.

As was suggested in Section I, it is expected that the size and distribution of urban population in small towns is likely to be determined by agricultural demand (or agricultural employment), while that of

large cities is expected to be uncorrelated with agriculture.

Table 10(a) gives the regressions for URBPOP. Once again the different variables are first introduced separately to test for collinearity effects that may arise when they are combined together in one regression. Agricultural employment is common to all the regressions reported. The coefficient of LAGRM is quite unstable over the 7 regressions, suggesting high correlation (0.72) with State Government employment (LGOST). Its correlation with Central Government employment (LGOCT) is also high (0.66). This suggests the derived nature of government employment. Indeed, a comparison of regressions (1) and (4) shows that the addition of LGOCT adds nothing to the level of explanation provided by just agricultural and factory employment. Indeed, the correlation of government employment, both central and state, is even more highly correlated with LFACT. Note that in equations where there is no LGOST where the coefficient of LAGRM is statistically significant, it is also quite stable at about 0.4. This means that about 5 agricultural jobs generate about 2 heads of urban population. Using a participation rate of about 35-36%, this means that it takes about 7 agricultural jobs to generate 1 urban job. The coefficient of LFACT varies between about 8 and 12 and that for LFACMX between 6 and 10. Accounting for the correlation with government employment, one can say that every basic manufacturing job induces an increase in urban population of about 8 to 10 or that it induces 3 to 4 other jobs.

Table 10(a) : The determinants of urban population in Indian states

Dependent variable : URBPOP

Independent variables	1	2	3	4	5	6	7
Constant	−16.87 (1.72)	−924 (0.66)	1253 (0.84)	−1701 (0.90)	−409 (0.22)	−2812 (1.42)	−935 (0.52)
LAGRM	0.414 (6.26)	0.046 (0.42)	−0.166 (1.61)	0.425 (3.68)	0.124 (1.15)	0.440 (3.03)	0.127 (1.11)
LFACT	12.16 (11.43)			12.40 (4.90)	7.50 (4.33)		
LFACMX						6.49 (0.90)	9.63 (4.32)
LGOCT		29.70 (7.97)		−0.74 (0.11)			
LGOST			16.55 (10.24)		7.78 (3.21)		
t	1084 (3.07)	1698 (3.81)	−567 (1.26)	1073 (2.88)	228 (0.55)	1852 (4.74)	452 (0.98)
R^2	0.881	0.801	0.859	0.881	0.907	0.854	0.902
$\overline{R2}$ (Adjusted R^2)	0.871	0.785	0.848	0.868	0.897	0.838	0.891

Note : 1. No. of observations in all regressions. 41
13 for 1961 (Punjab and Haryana taken as one State in 1961)
14 for 1971: 14 for 1981.
2. t statistics in parenthesis.

It is interesting to see that, contrary to expectation, central government employment appears to be almost totally derived: its coefficient is unstable. Government employment continues to be significant when included in an equation with agricultural, as well as factory, employment. The population multiplier for state government employment may be as high as that for LFACT, that is, between about 8 and 10. Note in Table 10a that regression (1) is not improved on significantly by the addition of government employment. It would then be reasonable to conclude that it is essentially agricultural and factory employment that is basic, while government employment is derived from these activities.

Table 10b gives the same results for CLASS-I cities only, i.e., the determinants of population in large cities. The first thing to note is that the significance of the coefficient of agricultural employment declines, as does its magnitude. It is now only about 0.15. This means that it takes about 6-7 agricultural jobs to induce an increase in large city population of 1, or that it takes about 15-20 agricultural jobs to create the demand for 1 job in large cities. The coefficients for LFACT and LAFCMX are quite stable, large and significant, as expected. Every factory job creates 2 to 3 jobs in large cities. Note also that the coefficient of central government employment (LGOCT) is significant at the 5% level in regression (2), and of sizeable magnitude, quite similar to that of LFACT. This suggests that central government jobs are largely located in large cities and they do indeed have a multiplier effect. The coefficients of LGOST are of about the same magnitude as they were in the URBPOP regressions. Regressions (5) and (6) are for 1961 and 1971 data only and use yet another measure of manufacturing employment. This is LMNHM, male employment in the non-household industry. This

includes all of manufacturing except the household industry, and is therefore not an adequate representation of basic manufacturing employment—its coefficients being smaller than those for factory employment—are consistent with this idea.

Table 10 (b): The determinants of urban population Indian states

Dependent variable : CLASS I

Independent variables	1	2	3	4	5	6
Constant	—2613	—3439	—1569	—2088	—1135	—648
	(2.12)	(2.72)	(1.43)	(0.52)	(1.17)	(0.61)
LAGRM	0.118	0.146	—0.079	—0.60	0.075	—0.072
	(1.57)	(1.57)	(1.24)	(0.92)	(1.32)	(1.14)
LFACT	8.31		5.64			
	(5.02)		(5.54)			
LFACMX		7.14		5.34		
		(3.99)		(5.62)		
LMNHM[1]					4.40	3.36
					(5.17)	(5.72)
LGOCT	4.20	8.05			2.95	
	(0.94)	(1.78)			(0.82)	
LGOST			6.82	9.63		5.75
			(4.79)	(4.32)		(3.20)
t	1030	968	217	443	315	—314
	(4.22)	(4.13)	(0.89)	(1.69)	(1.10)	(1.06)
R^2	0.900	0.898	0.938	0.939	0.924	0.948
$\overline{R2}$	0.889	0.890	0.931	0.932	0.910	0.938
No. of observations	41	41	41	41	27	27

[1]. Data not available yet from 1981 Census.
[2]. *See* Table 10(a).

Table 10(c) reports similar estimates for small towns. The first feature to note is the consistently significant and stable coefficient of male agricultural employment (LAGRM). About 9 to 10 agricultural jobs give rise to 1 job in a small town. This suggests that in the absence of any factory employment, the level of urbanisation in an exclusively agricultural economy should be in the region of about 10 *per cent*. This is not very far from the lowest levels that are observed internationally, as well as in India's most backward regions. The coefficients of LFACT and LFACMX are seen to decline in size and in significance level. It is noteworthy, however, that the most inclusive measure of manufacturing employment, LMNHM, essentially retains its magnitude and significance. It would seem that central government employment is not important in small and medium towns. The negative sign implies that most central government employment goes to large cities and perhaps attracts population out of small and medium towns. However, this argument cannot be taken too far, since the coefficient is not statistically significant. State government employment continues to be significant but highly correlated with agricultural employment, suggesting that state government employment is essential servicing agriculture.

Table 10 ((c): The determinants of urban population in Indian states

Dependent variable : NONCLASS I

Independent variables	All years 1961, 1971, 1981				1961 and 1971 only	
	1	2	3	4	5	6
Constant	912	627	1160	1153	859	1672
	(0.81)	(0.56)	(0.90)	(0.94)	(0.80)	(1.15)
LAGRM	0.306	0.294	0.203	0.187	0.255	—0.011
	(4.45)	(3.58)	(2.73)	(2.41)	(4.05)	(0.13)
LFACT	4.09			1.87		
	(2.71)			(1.57)		
LFACMX		2.87		1.26		
		(1.82)		(1.12)		
LMNHM[1]					4.35	0.92
					(4.65)	(1.13)
LGOCT	—4.95	—1.56			—9.66	
	(1.20)	(0.38)			(2.45)	
LGOST			0.96	1.18		4.67
			(0.58)	(1.20)		(1.95)
t	42.4	293	10.8	8.96	—49.3	—427
	(0.19)	(1.32)	(0.04)	(0.03)	(0.17)	(1.04)
R^2	0.672	0.638	0.661	0.650	0.763	0.743
$\overline{R2}$	0.635	0.598	0.624	0.612	0.720	0.696
No. of observations	41	41	41	41	27	27

[1]. Data not available yet from 1981 Census.
[2]. See Table 10(a).

What emerges from these results? First, the level of explanation is surprisingly high. About 90 per cent of the variance in urban population, as well as that of large cities, is accounted for by these formulations. The variance of small town population is not as well explained but still quite respectable, with R^2 of about 0.65. That large cities are not intimately connected with their hinterlands is supported by these results. Factory employment has a multiplier of about 3 to 4. Government employment is largely derived from the demands of the primary and secondary sectors; it does not appear to be autonomous or exogenous. In trying to explain government employment, it was regressed against agricultural and manufacturing employment (regressions not reported here). About 90 per cent of the variance is explained. About 75 agricultural jobs create 1 central government job, while only about 25 agricultural jobs create 1 state government job. Similarly, 3 factory jobs create 1 central government job, but create 2 state government ones. Small towns are more organically connected with agriculture, and the employment within them is essentially for the service of agriculture. Government employment has been found to be almost totally derived: it is clearly not autonomous.

In comparing the actual urban, large city and small town populations with predicted ones, it is found that Orissa was seriously lacking in adequate small town population, as was Maharashtra. Bihar and Madhya Pradesh are found to lack adequate large city population. These results are suggestive of a methodology that could be used for regional investigations in order to determine whether the lack of different sized towns is warranted or not.

IV. Urbanisation in Indian State: An Interpretation

The statistical results found in the simple estimations attempted have been found to be surprisingly good and consistent with the theory offered in Section I. The pattern of urbanisation in India is clearly not chaotic :in most states, it is much as would be expected from theory. This is somewhat surprising since the regularity of the pattern is not obvious at first glance. If the kind of simple equations used arr regarded as good forecasting equations, such a system of equations could even be used for forecasting and planning purposes. The prediction of inter-national or inter-regional growth rates of urbanisation has never been regarded as easy. An enlightened use of these estimation procedures could be quite useful.

As predicted, there is a tight relationship between levels of urbanisation and economic development. The surprising feature of the estimations is that the peak effect of income on urbanisation is found to be at quite low income levels and is in fact found within the sample of Indian states. This result is unexpected since the use of international data would suggest this turning to occur at much higher income levels. The only interpretation that can be offered here is that the effect captured is a *ceteris paribus* effect which is the pattern of the effect of income on urbanisation when the structure of employment does not change appreciably. This happens when overall income increases because of industrial growth, unaccompanied by matching changes in the agricultural sector, i.e., the familiar dualistic pattern. This may be the case in the more industrialised states in the country, namely, Maharashtra, Tamil Nadu, West Bengal and Gujarat. All have experienced a significant deceleration in their rates of urbanisation, except for Gujarat, and all have experienced stagnating agricultural productivity. Their historically high industrialisation and urbanisation levels were clearly not due to intrinsic forces of urbanisation and economic development, but rather because of the demands of the colonial system.

More light is shed on this issue by the effects of basic employment on urban population. It is of *great* interest to see that agricultural employment essentially creates demand for services and industry in only small and medium-sized towns. The population of large cities has little relationship with agricultural activity, except in an indirect fashion through general income growth, which creates demand for urban goods. Hence, in the situation of countrywide agricultural stagnation, as was the Indian experience in the 50-100 years before independence, the small amount of urbanisation that took place had to be "exogenous", based on colonial trade patterns. The great policy relevance of these findings is that *the growth of small and medium-sized towns is likely to be brought about by agricultural growth in the backward regions rather than by industrial dispersal.* The highly significant effect of factory employment on the generation of population in large cities would suggest a policy of industrial dispersal to existing large cities, which may now be somewhat industrially backward. Or, alternatively, it suggests the creation of new centers which will be of substantial size. There should be a dispersal of *concentrations* rather than a dispersal of concentration, per se.

The idea that economies of scale that exist in manufacturing cause the formation of concentrations is supported by the large population and employment multipliers found for factory employment. One of the key drawbacks in the work reported in this paper is the lack of a good indicator of "basic" tertiary sector employment. It is of great significance that government employment can largely be explained by basic agricultural and factory employment. The size of government is then not as exogenous as is often thought: and is hence not easy to trim.

The consistent story that emerges from the estimations in this paper is then described a follows. Increases in income do indeed lead to higher urbanisation levels. This is because of the diversification of activity that usually accompanies growth in incomes (because of Engel demand effects, etc). If this diversification does not take place, the urbanisation accompanying it would be slower than otherwise. Many of the non-agricultural activities exhibit economies of scale which *determine* the sizes of settlements that follow. The distribution between large, medium and small towns is therefore *determined* by the distribu-

tion of various economic activities. The number and distribution of small towns is particularly linked tightly with the level and distribution of agricultural activity. The hierarchy of economies of scale found in the manufacture of different products, along with the agglomeration economies as revealed by manufacturing employment multipliers, presumably, then *determines* the hierarchy of the size of settlements. Layers of urbanisation are cumulatively added on by the different basic activities.

This interpretation attempts to link the overall theory of urbanisation and economic development, as captured in a structural model of the kind sketched in Section I, with the "central place" theories concerning the distribution of settlements and the "economic base" theories for the size of a settlement. These explorations suggest that spatial sub-models can be grafted on to such countrywide sectoral models. The total agricultural employment, for example, as determined by such a model, could be used, in a sub-model, to generate one layer of urbanisation—the small and medium-sized towns. Total manufacturing employment, similarly, could be disaggregated and then used to generate the larger order settlements—and so on.

It is, perhaps, appropriate to conclude with a key policy implication of the findings in this paper. It is the growth of agriculture in the backward regions, and specifically the whole Eastern region, which needs the highest attention. This essentially means that technological innovations in rice and dry area crops need the greatest research inputs. This agricultural stagnation in the Eastern region is largely responsible for the increasing regional disparity in the country. The redressal of this disparity in agriculture is also, incidentally, the best policy for balanced urban growth. The focus on regional dispersal must be more on agricultural technology and less on manufacturing.

Appendix I

Table A. 1 : Urban population of states[1] in India 1951-1981

(In thousands)

State	Population of all towns				Population of towns above 20,000 (Class I, II, III)			
	1951	1961	1971	1981	1951	1961	1971	1981
Andhra Pradesh	5,419	6,275	8,403	12,458	3,358	4,732	6,942	11,312
Bihar	2,624	3,914	5,634	8,699	1,898	3,023	4,529	7,634
Gujarat	4,429	5,317	7,497	10,556	2,978	4,212	6,009	9,060
Haryana	968	1,308	1,773	2,822	617	950	1,394	2,321
Karnataka	4,452	5,466	7,122	10,711	2,593	3,669	5,319	8,870
Madhya Pradesh	3,135	4,627	6,785	10,589	2,008	3,141	5,097	8,170
Maharashtra	9,201	11,163	15,711	21,966	6,623	9,398	13,961	20,225
Orissa	594	1,110	1,845	3,106	303	618	1,317	2,367
Punjab	1,990	2,568	3,216	4,620	1,329	1,940	2,510	3,742
Rajasthan	2,955	3,281	4,544	7,140	1,646	2,173	3,321	5,611
Tamil Nadu	7,334	8,991	12,465	15,928	3,916	7,090	10,846	14,446
Uttar Pradesh	8,625	9,480	12,389	19,973	5,928	7,853	10,479	15,288
West Bengal	6,270	8,541	10,967	14,433	5,640	7,793	10,140	13,761
India[2]	6,1629	77566	10,6902	15,6192	43,169	61,418	89,607	134,898

1. Including all states with total population greater than 10 million in 1971 but excluding Kerala and Assam.
2. Including all states except Assam and Jammu and Kashmir.

Source: Census of India 1981 Provisional Population Totals Series I Paper 2 of 1981.

Appendix II

Sources of Data

Variable name	Source of Data
1. URBPOP 2. CLASS I 3. NONCLASS I 4. LAGRM 5. LMNHM	*Census of India* 1961, 1971, 1981
6. S.D.P. 7. VAFAC 8. FGNS	Centre for Monitoring the Indian Economy: *Basic Statistics Reltaing to the Indian Economy*, Vol. II, 1981
9. LGOCT 10. LGOST	Government of India: Ministry of Labour: Directorate General of Employment and Training *Employment* Review (Annuall) Various Issues.
11. LFACT 12. KWH	Government of India: *Statstical Abstract* (Annual). Various Issues.

MIGRATION PATTERNS IN PAKISTAN DURING 1970s : EVIDENCE FROM THE 1981 CENSUS DATA

AKHTAR HASAN KHAN AND MEHTAB S. KARIM

Introduction

The 1981 Census of Pakistan conducted in March 1981 indicated a total population of 83.8 million. The Census also revealed that during the past ten years, approximately 3.4 million people had moved internally i.e. across the district boundaries. On the other hand, during the same period, about 1.7 million people were reported to have left the country for overseas destinations. These numbers thus indicate a relatively high mobility among the Pakistani population. One important question which we may pause to ask is whether emigration has slowed down or speeded up the process of internal migration within Pakistan. Our aim in this paper is to assess the migration experience of Pakistan's population in the 1970s and in that process answer this basic question. To understand the mechanism of migration in Pakistan, we take a historical perspective, following which we first look briefly into immigration to Pakistan from other parts of the sub-continent and into internal migration during the 1950s and 1960s. Finally, on the basis of limited data available from the 1981 Census we explain the prevalence of both phenomenon, i.e., internal migration and emigration, during the previous decade.

Four decennial censuses have been conducted in Pakistan since independence. While the censuses of 1951 and 1961 included questions on place of birth of persons enumerated, no such question was included in the 1972[1] Census. Housing, Economic and Demographic Survey (HED) conducted in 1973 as a follow up of the 1972 Census, however, included questions on place of birth as well as period of continuous residence at the place of enumeration[2]. A similar question was included in the 1981 Census schedule.

Although, over the years, the way migration data are collected in censuses has undergone some changes, but the definition of a migrant has remained the same. Thus, only those persons were considered migrants who were borne in a district other than the district of their current residence. The volume of internal migration may be underestimated, however, when intra-district movements are involved. In a survey conducted in Gujranwala city, 30 per cent of migrants were reported to have come from within the district, (Social Sciences Research Centre, 1977). This may, however, only be true of short-distance migrants to a city within a district. The findings from the Survey may not, however, be generalized for the whole country.

Historical Perspective: 1901-1951

Present-day Pakistan has been a gateway to the sub-continent receiving several populations over the centuries, including Aryans, Arabs, Persians, Moguls and Afghans, among others, many of whose descendents are still to be found in the country. During this century, however, migration from other parts of the sub-continent to areas now constituting Pakistan was predominant. Data presented in Table 1 show a constant net migration to Pakistan, reaching an unprecedented level of about 1.8 million during the 1941-51 period. During the first four decades of the century, migration to western Punjab and Sind was mainly associated with the establishment of canal networks in the region which helped in the opening up of new farming lands. The British colonial government also encouraged farmers to move to the new settlements by providing lands at fairly cheap prices. In Punjab alone, the total area of land irrigated by canal rose from 2.3 million acres in 1887-88 to 6 million in 1900 and 12.4 million acres in 1930. Such changes were also noted in Sind (Davis, 1950). Subsequently, we may note the doubling of net migration to the region between 1901-21 and 1921-41.

The migration of settlers to the canal colonies had barely subsided when Pakistan emerged as an independent country in August 1947. Since the establishment of Pakistan was to provide a homeland for the Muslims after the British withdrawal from the subcontinent, it was accompanied by a mass movement of Muslim population towards Pakistan. On the other hand, movement of non-muslims to India also took place. Within a year, about 14 million people had moved in both directions across the boundaries of India and Pakistan. Population movement of that magnitude has remained unrecorded elsewhere in human history (Schechtman, 1963). The majority of movement was toward Pakistan, however. Thus, as revealed by the 1951 Census, in a population of 33.7 million over one-fourth were born in India. The net gain to Pakistan's population through migration alone was about 1.8 million. More important than the gain in population was the way the immigrants were distributed in the four provinces. Seventy-six per

[1]The census due in early 1971 was postponed due to the Indo-Pakistan war in December 1970 and was conducted in September 1972.

[2]The HED Survey was designed to cover about 2 per cent of rural and 5 per cent of urban households in all the four provinces and provide an estimate for the country after utilising proper weights. About 6.5 per cent of the country's population living in Federally adminisetered Tribal Areas in 1972 was not covered by the Survey. (Population Census Organiazation, n.d.h.)

33—5 RGI/ND/84

cent chose to settle in Punjab and another 21 per cent in Sind, while Baluchistan and North-west Frontier Province (NWFP) each received less than 2 per cent of all immigrants (Home Affairs Division, n.d.).

Another important consequence of the post-independence influx of immigrants was on the growth pattern of the urban population in Pakistan. As indicated by the 1951 Census, about one-third of the immigrants were settled in urban areas of Pakistan. In Baluchistan and Sind, however, over 72 per cent were relocated in urban areas. In Sind Province, immigrants were concentrated mainly in the cities of Karachi, Hyderabad and Sukkur, which in 1951 had a combined population of 1.4 million, of which 58 per cent were immigrants. The pace of urbanization which was thus started in 1951 has remained unchecked ever since, resulting in fast growth of the urban population.

Internal Migration during the 1950s and 1960s.

After the influx of immigrants from India in 1947, immigration into Pakistan has been negligible. The HED survey reported about 440,000 persons who were neither born in the geographical boundaries of Pakistan nor were immigrants from India. About 44 per cent of these had come from Kashmir during the previous two decades; the rest came primarily from Bangladesh in the early 1970s (Census Organization, n.d.b). Thus, because of the termination of the inflow of the Indian-born population during the 1950s and '60s, the percentage of migrants in the total population of Pakistan declined substantially from 24.3 to 15.5 between 1951 and 1973. Since immigration to Pakistan in 1947 and later has been largely of refugees[3], and our concern in this section is to discuss only internal migration, we have confined our analysis to those who were born within the geographical boundaries of Pakistan. The analysis also excludes the population enumerated in the Federally Administered Tribal Areas (FATA), which were not covered by the HED Survey.

The results presented in Table 2 suggest about the same level of internal migration prior to 1973 as prior to 1961. Two distinct features for the country are prominent, however. While in 1961 one-third of all internal migrants had crossed a provincial boundary, in 1973 over two-fifths were so classified. Secondly, even though the gap between the per cent of intra and inter-provincial migrants who settled in urban areas had narrowed over time, a substantially higher proportion of the latter were still settled in urban areas in 1973. Thus, out-of-province migrants show a preference for an urban setting than those moving within the province.

The provincial distribution of internal migrants is rather interesting. Between 1961 and 1973, with the exception of Punjab, each province reported a decline in the proportion of its population who were internal migrants. The biggest decline was for NWFP which had a decline of almost 50 per cent during the period, the decline, however, occurred only in the intra-provincial migration. Since migration from NWFP to other provinces is not reported to have declined, it appears that for some unknown reason the pace of intra-provincial migration of NWFP population has declined considerably during the 1960s. On the other hand, migration to NWFP increased somewhat during the period, mainly from Sind.

The proportion of inter-provincial migrants in Punjab increased during the period. Most of the recent inter-provincial migrants to Punjab, however, had originated in Baluchistan. A considerably smaller proportion of migrants in Baluchistan and Sind originated from within the province, especially in the latter, where over 70 per cent of migrants came from outside the province, predominantly from Punjab. This is largely due to the location of the city of Karachi in Sind. Being the major industrial and commercial center of the country, Karachi has been receiving migrants from almost all the districts in the country and has been a popular destination for all kinds of migrants (Shah, 1982). Consequently, we may note that about 60 per cent of all inter-provincial migrants to Sind were settled in urban areas of the province.

A considerably higher representation of migrants from Punjab is recorded in all three provinces. This is because of the fact that about 61 per cent of the country's population lived in Punjab as indicated in the 1951 Census. Compared with 18, 12, and 4 per cent which lived in Sind, NWFP and Baluchistan, respectively[4]. As a result of inter-provincial migration over the past three decades, a considerable shifting of population has occurred, however, primarily from Punjab to Sind. Thus, the 1981 Census data suggest that Punjab had 56 per cent of the country's population compared with 23 per cent in Sind, a decline of 5 percentage points in the former and as much gain in the latter. One more reason for the increase in Sind's population, however, is lesser mobility of its population not only across the provincial boundary but even within the province as shown in Table 2.

Migration Situation in 1970s

As reported earlier, during the 1970s migration in Pakistan has shown some interesting patterns which include both internal migration and emigration. In this section, on the basis of analyses of 1981 Census data, we look first at the level and prevalence of internal migration during the previous decade, in terms of proportion of migrants in the population, net migration to urban areas of each province and major cities, and age, sex differentials, and rural-urban destinations of migrants. Finally, analyses of emigration are also undertaken.

---

[3]During 1980-82 above 2.8 million Afghan refugees have entered Pakistan. Although it is not yet clear how permanent their stay in Pakistan will be, we have not included them in our analysis.

[4]Others lived in the Federally Administered Tribal Areas.

Internal Migration

Table 3 provides the proportion of migrants in the population aged 10 years and above and classifies them further into two categories: (1) those who migrated during the last ten years; and (2) those migrated more than ten years ago. Comparative data are also provided from the HED survey. The overall percentage of in-migrants in the population has declined substantially from 23 to 16 per cent between 1973 and 1981, primarily because of the attrition by death of Indian-born population. This is further confirmed by the sharp decline in the percentage of those who migrated more than ten years earlier—from 18 in 1973 to 11 in 1981. The percentage of those who migrated during the last ten years has, however, remained about the same, which suggests that the internal migration has remained at the same level throughout the 1960s and '70s. Similarly, within both rural and urban areas, about the same percentage of population was classified as migrant during the previous ten years in 1973 as in 1981.

The growth rate of the urban population—and especially of larger cities—during the 1972-1981 intercensal period was almost twice the growth rate of the rural population. While the rural population grew by 23 per cent during that period, the total urban population and the combined population of the 12 major cities grew by 40 and 44 per cent respectively (Shah and Karim, 1982). Data presented in Table 4 reveal some interesting growth patterns in the urban population of the four provinces as well as the 12 major cities containing over 75 thousand population in 1972. The urban population of Baluchistan grew most rapidly and that of NWFP at the slowest rate during the period. Population growth of cities with less than 500 thousand population in 1972 was, however, relatively higher than the average growth of the urban population—with the exception of Karachi, the country's largest city. Thus, a new pattern of migration towards the medium-sized cities seems to have emerged in the 1970s, almost a reversal of what was observed during the 1961-1972 intercensal period. During the 1961-72 period, four out of the six largest cities recorded growth at the rate of 67 to 94 per cent (Shah and Karim, 1982).

Table 4 further provides estimates of net migration to urban areas of the four provinces and 12 largest cities. Because of the absence of either a vital registration system in the country or any accurate estimates of vital rates for the provinces or cities, we are constrained to use the "national growth method"[5] to estimate the number of net migrants. This method, although widely used, does not take into account any regional variations in natural increase nor international migration, and assumes that such rates are about the same for all subdivisions of the country (Shryock and Siegel, 1976). On the basis of recent findings on fertility and mortality in Pakistan, we observe no differentials either between rural and urban areas or between provinces (Alam and Shah, 1982). During the previous decade, large-scale emigration from Pakistan has occurred. The rate of emigration from rural and urban areas and each of the provinces, however, may not be the same. We therefore have to interpret the net migration data with some caution. Emigration rates are likely to be higher for larger cities than the national average; thus, the rate of net migration provided in Table 4 may indeed be an under-estimate.

A great deal of variation is observed in the volume of net migration, as well as in the net migration rates, to the urban areas within each province and in major cities. Almost 2.5 million net migration is observed in the urban areas of Pakistan, and these constituted 15 per cent of country's urban population in 1972. The rate is about three times higher in Baluchistan. Moreover, Sind's rate is close to the national average and Punjab and NWFP have net migration rates lower than the national average. About 36 and 7 per cent of total net migration in urban areas are observed in Sind and Baluchistan respectively. This suggests that the flow of migrants to the two provinces is relatively higher than the proportion of the country's urban population in the two provinces—21 and 2 per cent respectively in 1981.

When analyzing data on net migration to the major cities, some interesting patterns are revealed. The three major cities, Quetta, Peshawar, and Karachi—provincial capitals of Baluchistan, NWFP and Sind provinces, respectively—had the major share of net migration within each province (52, 62, and 67 per cent respectively). About one-fourth of total net migration to urban areas in Pakistan were towards Karachi alone. Hyderabad, on the other hand, is the only major city which recorded a population growth rate below the national average, and a negative rate of net migration, while Gujranwala and Quetta were the fastest growing cities. Such findings are also reported in small scale surveys conducted in the three cities between 1973 and 1978 (Social Sciences Research Centre, 1977; Karim, Jan, and Kazi, 1983). Cities in Punjab provide an interesting contrast. The four largest having over 500 thousand population in 1972 recorded relatively low rates of net migration—less than one-fourth to one-half the national average—while the three medium-sized cities had fairly high rates. This may be more because of the better economic opportunities available to migrants in smaller cities than larger cities losing their attraction for migrants. In fact, at least two of the smaller cities in Punjab—Gujranwala and Sialkot—have emerged as centers of small-scale industries over the past two decades. The slow growth rates of Rawalpindi and a low rate of net migration there is more associated with the growth of Islamabad, established in 1960 as Pakistan's new capital. Rawalpindi is only 10 miles away from Islamabad and served as the interim capital in the early 1960s. For that reason, it recorded a population growth of 81 per cent during the 1961-1972 intercensal period. However, with the establishment of the latter as a self-contained city and development of housing facilities there, Islamabad's popu-

[5] For calculations please see Table 4.

lation grew from 77 thousand in 1972 to 202 thousand in 1981. Thus, Islamabad recorded a net migration rate of 134 per cent during the intercensal period. If the persent trend of internal migration continues towards the medium-sized cities, it is likely that in the future Pakistan's urban population will be more dispersed in medium-sized cities around the country than in a few major cities.

Age and Sex Profiles of Recent Migrants

On the basis of information available from earlier studies, we only have a limited knowledge of characteristics of migrants in Pakistan. In a review of several micro-level studies of migration in Pakistan, Karim and Robinson (1982) suggest that the typical migrant appears to be a male in his late 20s to 30s who comes from a large extended family unit, had worked in agriculture, and has 3 to 5 years of education or is at least literate. About two-thirds of all male migrants were married and in most cases were accompanied by their family. In comparing the characteristics of recent male and female migrants on the basis of the HED survey, Shah (1982) provides some interesting contrasts. Forty-two per cent of the males and 49 per cent of female migrants were between ages 10-24. Forty-four per cent of the males as compared with 29 per cent of the females above age 10 were single, and 41 per cent of the former and 68 per cent of the latter had not attended school.

Data presented in Table 5 confirm somewhat similar age patterns of recent migrants as reported in earlier studies. When migrants are sub-divided into three categories—Recent: migrated during the past 4 years; intermediate: migrated 5-9 years ago; and long-term: migrated 10 years ago or earlier than the Census some unique patterns are visible. Although long-term migrants include both immigrants from India as well as internal migrants, the predominance of the former is clearly indicated in the age-specific percentage distribution. Since Indian immigrants moved mostly in 1947, they would be aged 35 and above in 1981. Consequently, we may note a sudden increase in the percentage of long-term migrants at older ages, both in rural and urban areas, and for males as well as females. The percentage of long-term migrants in urban areas is about 2.5 to 3 times greater than in rural areas, not only because a substantial proportion of Indian immigrants had settled in urban areas but also because of a higher rate of migration to the urban than the rural areas in the later decades (Burki, 1973).

When analyzing in terms of age and sex distribution of recent and intermediate categories of migrants, some interesting patterns are apparent. Those currently in rural areas remain relatively immobile. Only about one per cent of population in all ages, with the exception of females in their twenties, had migrated during the previous 5-9 years, apparently because of marriage-related moves. Similarly, recent migration among rural residents was relatively lower for each sex when compared with urban residents. In urban areas, among ages 20-34 for males and 15-29 for females, over 11 and 7 per cent of males and females were classified as recent migrants respectively, compared with only 3 per cent of fewer in rural areas in same ages. No significant differences in the percentages of migrants among males and females in the intermediate category of migrants (i.e., 5-9 years) is observed, however.

Age-specific distributions of migrants for each sex and within rural and urban areas for two periods of migration, provide some interesting insight into migrant selectivity (Figure 1). While only a slight variation in age-specific distribution is observed by sex among the intermediate category of migrants, the percentage is not only high for ages 20-34 among males and ages 20-29 among females, but the gap between the two sexes is quite wide. This is perhaps because earlier migrants were either moving as a family unit—especially with spouses—or male migrants would tend to bring their spouses only after establishing themselves in the city. Thus, the 1981 Census data suggest that not only has male migration to urban areas increased in the latter half of the 1970s, but it is quite likely that a majority of them are married and have moved as single persons. This is further confirmed by a very high sex ratio (data not shown) among recent migrants to urban areas, especially in ages 30-54, where the average number of males is over twice the average number of females. Since over 86 per cent of males in ages 30-54 were married, as reported in the 1972 Census, it is quite likely that migrants to urban areas have left their spouses behind in rural areas.

An earlier study based on the 1951 and 1961 census data (Afzal, 1967) shows an identical rate of migration to urban areas for males and females, suggesting a pattern of family migration. On the other hand, Afzal and Abbasi (1979) in comparing 1951—1961 and 1961—1972 intercensal data show a higher rate of female urbanization in the latter decade. They thus suggest a growing tendency toward family migration coupled with an increase in female migration related to marriage or in pursuit of education. Furthermore, Shah's (1982) analysis using HED survey data does not indicate a predominance of males among recent migrants to urban areas. The 1981 Census data, however, suggest an increase in male migration in recent years. One plausible explanation of such an increase may be the increasing tendency of male workers to emigrate abroad, especially to the Middle-Eastern countries in the recent past. Thus, it is likely that there has been an upsurge in temporary migration to urban areas, which could open several avenues to emigration for rural residents, such as location of most of the recruiting agencies in cities and more access to emigration facilities, including government offices and foreign missions. While some of the male migrants could indeed proceed abroad, those who are not successful may still prefer staying in the city in the hope of emigrating in the near future or eventually settling there permanently. As we shall see later, emigration from Pakistan to the Middle-East increased substantially in the latter half of the 1970s, and therefore a higher proportion of male migrants to

urban areas in recent years is perhaps an aspect of stepwise migration. In that process, however, male migrants would prefer leaving their spouses behind in rural areas. Data are lacking to substantiate the hypothesis that males are moving to urban areas to avail themselves of the opportunities of emigration from Pakistan. But the unprecedented emigration of workers which has taken place over the past few years lends support to the argument.

Emigration of Workers

Emigration from Pakistan has been primarily of workers, which began on a modest scale in the late 1950s. For that stream, the United Kingdom was a popular destination (Akbar, 1981). The numbers, however, were never substantial enough to generate much interest in studying the outflow from the country. When the sparsely populated and oil-rich Middle-Eastern countries launched their ambitious development plans in the early 1970s, they needed large numbers of additional workers, both skilled and unskilled, to provide the manpower. Pakistani workers were among the first to seize the opportunity and migrated to several of these countries in unprecented numbers. Realizing the increasing desire among workers to seek employment in the Middle East, in 1972 the Government of Pakistan established the Bureau of Emigration and Overseas Pakistanis to function as a clearing agency for overseas migration. Statistics maintained by the Bureau were largely incomplete until 1976. However, they reveal a staggering increase in the emigration of workers beginning in the mid-1970s (Table 6). Currently, over 115 thousand workers are leaving the country annually (Pakistan Finance Division, 1982), which may still be an underestimate as we have noted later.

Various estimates have been made of Pakistani nationals who are living or working abroad. Three such estimates provided by the two agencies of the Government of Pakistan for 1979 and through a sample survey are shown in Table 7. The estimates made by the Ministry of Foreign Affairs and the Overseas Pakistanis wing of the Manpower Division vary between 1.2 to 1.3 million. The two agencies arrive at their estimate through the records of Pakistanis living abroad; however, these records may not be completed since some persons could still be excluded—especially those who had left the country illegally. Gilani, et al. (1981), reached an estimate of 1.8 million on the basis of national sample surveys in about 15,000 households in Pakistan. Their estimate is about one-third higher than the estimates given by the two agencies of the Government of Pakistan. All the three sources suggest that about 70 per cent of all emigrants were located in the Middle East. Gilani, et al.'s, study further revealed that the majority of emigrants (about three-fourths) had obtained their jobs in the Middle East through their own arrangements (such as relatives, friends or other connections). Gilani, et al.'s, estimates of occupation of emigrants differs somewhat with the official statistics of the Bureau of Emigration (Akbar, 1981). Both suggest about 5 per cent of them as professionals, however, 41 per cent were reported to be skilled by the former, and 45 per cent by the latter. Similarly, unskilled workers were reported to be 43 and 50 per cent by each source, respectively.

Due to the importance of establishing an accurate number of emigrants from Pakistan, a special question[1] seeking information on the number of persons who had left the enumerated households during the past ten years for foreign destinations was included in the 1981 Census schedule. Information on age, sex and the country of destination or current residence was, however, not obtained. A total of about 1.7 million persons were reported to have left the country over the past decade, an estimate which is close to the one provided by Gilani, et al. The Census data also indicate that about 82 per cent of emigrants originated in rural areas (Table 8). It is likely, however, that a greater proportion of emigrants had migrated first to urban areas and later moved to a foreign destination than had emigrated directly from a rural area. Nevertheless, they would be counted as originating in rural areas, especially if their household members have remained there. In case the entire household had moved out, the number of emigrants may be underestimated. Such a likelihood may exist more in urban than rural areas, since usually the household composition in the latter is such that some members may prefer to stay in the household. That may not be the case in urban areas, where the likelihood of a family moving as a unit is high. Another important finding is the substantially higher percentage of emigrants originating in NWFP (37 per cent) which in both 1972 and 1981 censuses constituted only 13 per cent of the country's population. About 94 per cent of NWFP emigrants, however, originated in rural areas. Following Burki's (1980) argument, it is likely that most of the imigrants from NWFP are located in the Middle East as manual labourers. In comparison, relatively lower percentage of emigrants were reported to have originated in the rural households in Punjab and Sind (78 and 71 per cent respectively). These emigrants are perhaps relatively more in the skilled and semi-skilled occupations as was found by Gilani, et al. It is surprising, however, that the percentage of emigrants originating in the rural areas of Punjab and Sind is relatively higher than the population in rural areas of the two provinces (73 and 57 per cent in 1981 respectively). This lends support to our earlier argument that the likelihood of an emigrant being reported as of rural origin may be greater, even though he had migrated to an urban area first and only later had proceeded overseas. Since data are lacking at this point, we are unable to support our argument of stepwise migration further.

Summary and Conclusions

During the first half of this century, Pakistan has been receiving migrants from other parts of the subcontinent. In the 1950s and '60s, a pattern of internal

[1] "Did any member/members of your household leave the country during the previous ten years and is/are still living there? If yes, how many - " (1980-81 Population and Housing Census, Form 4).

migration involving rural-to-urban and inter-provincial migration has emerged. During the 1970's two streams of migration were quite prominent, namely:

(i) from rural to urban areas, involving movements across the provincial boundaries and, more specifically, to some cities with less than 500 thousand population, and

(ii) emigration of Pakistanis to overseas destinations. Over four-fifths of the emigrants originated in rural areas and were most likely to be found in the Middle East.

One important implication of the emigration is its linkages with the process of internal migration. The short and the long-run effects of emigration on internal migration are likely to be in both directions. Due to the higher volume of emigration from rural areas, not only may the pool of potential internal migrants be reduced but, with an increased household income, fewer members need to migrate internally. Since an internal migrant usually moves with the family, the volume of migration is substantially increased. That is less likely the case for emigrants who have to leave their families behind. On the positive side, emigration, especially from urban areas, may indeed increase the volume of internal migration further, since the workers leaving the country leave "slots" in the occupational hierarchy into which other workers can move. Such upward occupational movement typically also involves geographical movement. Secondly, as a result of the decrease in demand for additional workers in the receiving countries due to the economic slowdown coupled with more competition among sending countries, the country's rural population which during the previous decade was emigrating may be diverted towards urban areas within the country. Furthermore, assuming that the overseas emigrants eventually return home—which is highly likely as they are mostly in the Middle East as contract workers—the long-run effects of emigration then will be a sudden increase in internal migration to urban areas. We have observed from the 1981 Census data that more than four-fifths of all emigrants originated in rural areas, and it is possible that they will prefer city life upon their return home because of the facilities and opportunities available in urban areas in comparison with rural areas in Pakistan. The likelihood of their dependents also moving to urban areas is also strong. Finally, the higher level of income which the families of emigrants are likely to achieve may itself result in their movement to urban areas in search of better educational facilities for their children and what comforts the urban life may offer them.

Migration thus has become an important aspect of Pakistani society and will remain an important issue in the study of the demographic situation in Pakistan. Further analysis of the 1981 census data will indeed be quite useful in pointing out some of the effects of migration during the recent past, similarly expected changes may be forecast over the coming years.

Table 1: Intercensal Net Migration to Pakistan from Other Parts of Indian Sub-Continent—Average Based on Age and Place of Birth Data, 1901-1951

Intercensal Period	Estimated Net Migration
1901–11	328,226
1911–21	243,614
1921–31	729,051
1931–41	661,017
1941–51	1,767,904

Source: Afzal (1974) Table 29.

Table 2: Internal migrants in Pakistan-born populations by province, type of move, origin and per cent in urban Areas, 1961 and 1973

	Per cent internal migrants		Per cent of migrants settled in urban areas	
	1961*	1973†	1961	1973
1	2	3	4	5
Total Internal Migrants (in 000)	1,500	2,742	..	..
Per cent of Internal Migrants				
Among Pakistan-Born Population	7.7	7.8	31.5	34.2
Intra-Provincial	5.3	4.5	21.9	28.8
Inter-Provincial	2.4	3.3	52.5	41.6
BALUCHISTAN	7.0	6.0	36.6	16.4
Intra-Provincial	2.5	3.3	9.7	7.1
Inter-Provincial	4.5	2.7	50.4	25.6
From NWFP	1.4	0.6	49.9	37.8
From Punjab	2.3	1.3	68.8	31.4
From Sind	0.8	0.8	12.8	13.8

Table 2 : Internal migrants in Pakistan-born populations by province, type of move, origin and per cent in urban Areas, 1961 and 1973—*Concld.*

1	2	3	4	5
NWFP	9.7	5.1	17.1	15.8
Intra-Provincial	7.8	2.6	6.7	21.0
Inter-Provincial	1.8	2.5	37.2	12.0
From Baluchistan	0.1	0.1	13.3	23.7
From Punjab	1.6	1.6	59.6	13.0
From Sind	0.1	0.8	72.3	6.9
PUNJAB	7.3	8.4	28.6	29.9
Intra-Provincial	6.6	6.2	27.7	29.9
Inter-Provincial	0.7	2.2	54.5	30.0
From Baluchistan	0.1	1.2	44.8	48.5
From NWFP	0.5	0.7	56.3	53.9
From Sind	0.1	0.3	51.1	33.2
SIND	9.8	8.8	47.0	53.7
Intra-Provincial	2.8	2.2	21.2	31.6
Inter-Provincial	7.0	6.7	57.0	60.8
From Baluchistan	0.9	1.1	44.4	42.6
From NWFP	1.9	1.9	70.2	82.1
From Punjab	4.2	3.7	47.6	55.1

Source : *Population Census of Pakistan, 1961, Vol. 3
†Housing Economic and Demographic Survey, Report Vol. II
(Recalculated from Farooqui and Rukunuddin, 1982).

Table 3 : Percentage of migrants in population age 10+ by period of migration and rural-urban residence, 1973 and 1981

Current Resident	1973* Period of Migration			1981† Period of Migration		
	<10 years	10+ years	All	<10 years	10+ years	All
Rural	3.0	12.2	15.2	3.0	7.6	10.6
Urban	10.3	30.7	41.0	10.0	19.7	29.7
Pakistan	5.3	17.6	22.9	5.1	11.0	16.1

Sources : *Housing Economic and Demographic Survey, Report Vol. II.
†Population Census of Pakistan, 1981, Special tabulations.

Table 4 : Net migration rates to major Cities and urban areas by province, 1972-81

Province and City	Population (in 000) 1972* (1)	Population (in 000) 1981† (2)	Proportional Increase (3)=(2)—(1)/(1)	Estimated Net‡ Migration (in 000) (4)	Net Migration Rate (5)=(4)/(1) × 100
1	2	3	4	5	6
Baluchistan (urban)	400	672	.680	159	39.7
Quetta	158	285	.804	82	51.9
NWFP (urban)	1,195	1,658	.387	125	10.5
Peshawar	373	555	.488	77	20.6

Table 4 : Net Migration rates to major cities and urban areas by province, 1972—81—*concld.*

1	2	3	4	5	6
Punjab (urban)	9,183	12,971	.413	1,191	13.0
Lahore	2,170	2,922	.347	139	6.4
Faisalabad	823	1,092	.327	36	4.4
Rawalpindi	615	806	.311	17	2.8
Multan	539	730	.354	33	7.1
Gujaranwala	324	597	.843	181	55.9
Sialkot	204	296	.451	34	16.7
Sargodha	200	294	.470	37	18.5
Sind (urban)	5,726	8,226	.437	831	15.4
Karachi	3,515	5,103	.452	594	16.9
Hyderabad	629	795	.264	—12	—1.9
Islamabad (urban)	77	202	1.623	103	133.8
Pakistan (urban)	16,581	23,729	.431	2,453	14.8
Pakistan (total)	65,309	83,782	.233	..	..

Source : *Population Census of Pakistan, 1972. Statistical Report of Pakistan.

†Population Census of Pakistan 1981, Bulletin 1.

‡$\frac{(Pi' - Pio \quad PT' - Pio) - NR \times Pio}{Pio \qquad PTo}$

Where PT′ and PTo are the national populations at the beginning and the end of the intercensal period, respectively and Pi′ and Pio are the respective populations of a city at two censuses. NR is the proportional increase in the national population during the intercensal period i.e., .283. (See Shryock and Siegal, 1976).

Table 5 : Age specific percentage distribution of migrants by sex, current residence and period of migration, age 10+, 1981

Age Group	Rural Male			Rural Female			Urban Male			Urban Female		
	Period of Migration			Period of Migration			Period of Migration			Period of Migration		
	<5 yrs.	5-9 yrs.	10+ yrs.	<5 yrs.	5-9 yrs.	10+ yrs.	<5 yrs.	5-9 yrs.	10+ yrs.	<5 yrs.	5-9 yrs.	10+ yrs.
10—14	1.5	.9	1.2	1.1	.9	1.2	4.3	2.7	3.3	3.5	2.7	3.2
15—19	1.8	.9	2.1	2.5	.9	2.1	7.4	3.4	6.0	4.7	2.8	5.6
20—24	2.5	.9	2.6	3.2	2.0	2.6	11.2	4.2	8.1	7.5	4.6	8.0
25—29	2.8	1.0	2.9	2.3	2.3	4.1	12.0	4.8	11.1	7.2	5.8	13.3
30—34	2.7	1.2	4.3	1.8	1.6	6.8	11.1	4.9	18.6	5.5	4.7	23.3
35—39	2.6	1.2	12.2	1.6	1.2	13.6	9.1	4.8	35.3	4.6	3.6	39.4
40—44	2.2	1.1	13.8	1.3	1.0	14.9	7.1	4.3	40.0	3.7	3.1	42.0
45—49	2.0	1.1	15.4	1.3	.9	16.3	5.4	3.7	44.0	3.2	3.1	44.0
50—54	1.8	1.0	15.2	1.2	.9	16.0	4.6	3.6	43.2	2.9	2.8	42.9
55—59	1.3	1.1	16.9	1.2	.8	17.1	3.8	3.2	47.4	2.8	2.3	44.0
60+	1.3	.8	17.2	1.1	.8	17.3	3.1	2.6	44.7	2.8	2.4	41.9
Total	2.0	1.0	7.3	1.8	1.2	7.9	7.5	3.8	19.8	4.8	3.6	19.7

Source : Population Census of Pakistan 1981 special tabulations.

Figure 1 Percent Migrant in each Age-group by Sex, Rural-Urban Residence and Period of Migration

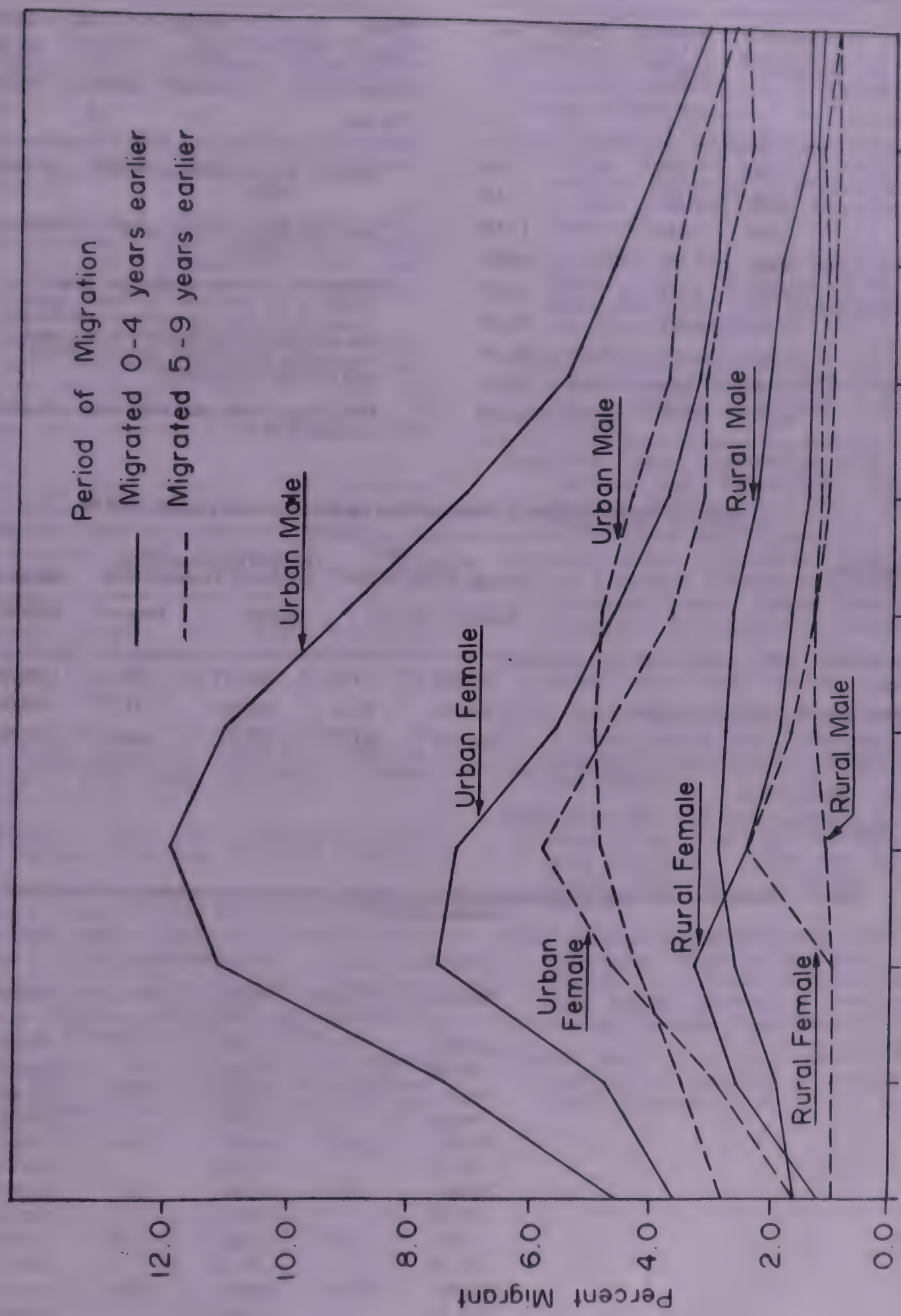


Table 6 : Number of emigrant workers from Pakistan, 1971-81

Year	Recruited by private agents*	Recruited by Government of Pakistan	Direct emigrants†	Total
1	2	3	4	5
1971	3,340	194	..	3,534
1972	3,359	1,171	..	4,530
1973	7,654	4,646	..	12,300
1974	14,652	1,676	..	16,328
1975	21,766	1,311	..	23,077
1976	38,516	3,174	..	41,690
1977	77,664	2,606	60,175	140,445
1978	78,685	3,246	47,602	129,533
1979	80,615	3,058	34,586	118,259
1980	91,482	17,114	24,801	133,397
1981	119,711	821	32,549	153,081
Total	537,444	39,017	199,713	776,174
Per cent	69.3	5.0	25.7	100.0

Sources: Finance Division (1982); and Shah and Karim (1982).

Note: For details of this procedure of emigration, see Akbar (1981: 25-35).

*About 400 overseas employment promoters have been licensed by the government to recruit workers on behalf of foreign employers. The work of these promoters is regulated and controlled by the Regional Protectorates of emigrants who work under the Director General, Bureau of Emigration and Overseas employment.

†This includes individual work visas obtained through relatives and friends.

Table 7 : Various estimates of Pakistanis living abroad by current residence, 1979-80

Current Residence	Ministry of Foreign Affairs, 1979*		Overseas Pakistanis Wing, Manpower Division, 1979*		Gilani et al., 1980†	
	Number	Per cent	Number	Per cent	Number	Per cent
Middle-East	882,700	71.6	865,177	68.7	1,246,000	69.6
Europe, North America and other countries	349,916	28.4	394,540	31.3	544,000	30.4
Total	1,232,616	100.0	1,259,717	100.0	1,790,000	100.0

Sources : *Hyder (1981)

†Gilani et al. (1981)

Table 8 : Number and percentage of persons gone abroad during the last ten years by province and Rural-Urban Residence, 1981

Province	From Rural Area		From Urban Area		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Baluchistan	67,846	4.8	9,280	3.2	77,126	4.5
	(88.0)		(12.0)		(100.0)	
NWFP	555,637	39.3	35,768	12.1	591,405	34.6
	(94.0)		(6.0)		(100.0)	
Punjab	576,522	40.7	158,763	54.0	735,285	43.0
	(78.1)		(21.6)		(100.0)	
Sind	213,019	15.1	87,335	29.7	300,354	17.6
	(70.9)		(29.1)		(100.0)	
Islamabad	1,436	0.1	2,933	1.0	4,369	0.3
	(32.9)		(67.1)		(100.0)	
Pakistan	1,414,460	100.0	294,079	100.0	1,708,539	100.0
	(81.8)		(17.2)		(100.00)	

Source: Population Census of Pakistan, 1981, special tabulations.

Numbers in parentheses represent rural-urban percentage distribution of migrants within each province and within Pakistan.

References

Afzal, Mohammad. 1967. Migration to Urban Areas in Pakistan. In Proceedings of the Conference of the International Union for the Scientific Study of Population. Sydney, Australia.

Afzal, Mohammed. 1974. *Population of Pakistan.* Islamabad: Pakistan Institute of Development Economics.

Afzal, Mohammed; and Abbasi, Nasreen, 1979. Urbanization and Internal Migration in Pakistan: 1951—1973. Mimeographed Draft. Islamabad: Pakistan Institute of Development Economics.

Akbar, Muhammad, 1981. Country Paper: Pakistan. *Emigration for Employment.* Report on ARPLA Symposium on overseas recruitment procedures for senior officials of South Asian countries, ILO, Islamabad, May 1981.

Alam, Iqbal; and Shah, Nasra M, 1982. Population Composition, Mortality and Fertility. In Nasra M. Shah (ed.) *Pakistani Women, A Socioeconomic and Demographic Profile.* Manuscript. Honolulu: East-West Population Institute.

Burki, Shahid Javed. 1973. Rapid Population Growth and Urbanization: the case of Pakistan. *Pakistan Economic and Social Review,* Vol. XI, No. 3: 240—276.

Burki, Shahid Javed. 1980. What Migration to the Middle East May Mean for Pakistan. *Journal of South Asian and Middle Eastern Studies,* Vol. III, No. 3 : 47—76.

Davis, Kingsley. 1950. *The Population of India and Pakistan.* Princeton: Princeton University Press.

Farooqui, M. Naseem Iqbal and Rakunuddin A. Razzaque, 1982. Levels and Trends of Migration in Pakistan (Mimeo).

Finance Division. 1982. *Pakistan Economic Survey* 1981-82. . Islamabad: Government of Pakistan, Economic Advisor's Wing.

Gilani, Ijaz; Khan, M. Fahim; and Iqbal, Munawar. 1981. *Labour Migration from Pakistan to the Middle East and its Impact on the Domestic Economy.* 2 parts. Research Report Series nos. 126 and 127. Islamabad; Pakistan Institute of Development Economics.

Home Affairs Division. n.d. *Census of Pakistan Population* 1961. Vols. 3. Karachi: Government of Pakistan.

Karim, Mehtab S.; and Robinson, Warren C. Forthcoming. Migration and Its consequences: An Analytical Review of the Situation in Pakistan. In Peter Kunstadter (ed.) *Migration and Its Consequences.*

Karim, Mehtab S., Jan, Tariq Sajjad and Kazi, S. Firasat. 1983. Migration to two Pakistani cities. Honolulu: East-West Population Institute (Under Preparation).

Population Census Organisation. n.d. *a. Population Census of Pakistan* 1972: *Statistical Report of Pakistan.* Islamabad: Government of Pakistan.

Population Census Organisation. n.d.*b. Housing, Economic, and Demographic Survey* 1973: *Statistical Tables.* Vol. 2, part 1. Islamabad: Government of Pakistan.

Population Census Organisation. 1981. *Housing and Population Censuses of Pakistan* 1980-81: *Provisional Tables.* Census Bulletin No. 1. Islamabad: Government of Pakistan.

Schectman, J.B. 1963. *The Refugees in the World.* New York: Barnes.

Shah, Nasra M. (ed.) 1982. *Pakistani Women: A Socioeconomic and Demographic Profile.* Manuscript. Honolulu: East-West Population Institute.

Shah, Nasra M.; and Karim, Mehtab S. 1982. Migration, Urban Growth and Development: Pakistan's Experience. *Asian and Pacific Census Forum.* Honolulu: East-West Population Institute.

Social Sciences Research Centre, 1977. Factors Influencing Migration to Urban Areas in Pakistan: A case study of Gujranwala. Islamabad: Pakistan Institute of Development Economics. Research Report No. 101.

Shryock, Henry S.; and Siegel, Jacob S. 1976. *The Methods and Materials of Demography.* New York: Academic Press.

SPATIAL ORGANISATION OF THE NATIONAL ECONOMY—WITH SPECIAL REFERENCE TO THE ROLE OF MARKET TOWNS AND PRODUCTION CENTRES—LESSONS FROM INDIAN EXPERIENCE

L. S. Bhat

Indian economy in its structure and spatial organisation continues to exhibit marked contrasts and duality as between rural and urban components. The contribution of agriculture and allied activities to GNP is as high as 50 per cent. The rural population constitutes 76.2 per cent of the total and the population distribution shows a tendency towards infilling in areas of relatively high density which also correspond with those of agriculturally rich Indo-Gangetic plains and the coastal areas girdling the peninsular plateau. The urban population of 156.19 million (1981) constituting 23.78 per cent of the total has a major share in the GNP contributed by the secondary and the tertiary sector. In terms of the areal spread, and the number of locations the dichotomy is more pronounced. For example, the number of villages in the country is approximately 0.5 million in contrast to 3245 urban centres and the spatial distribution of urban centres and large villages (of over 2500) also follows closely the overall pattern of population distribution.

Due to sharp regional contrasts in physical environment, resource base, socio-cultural, and economic development large-scale mobility of population across the length and breadth of the country is not contemplated. Added to these, the language factor, low level of literacy and skills create artificial barriers across the States and thus limit large-scale out migration. This is corroborated by the data on migration which reveal that intra-District and inter-District (within a State) migration are more dominant than inter-State migration. As a result, even in 2000 A.D. when the total population of the country reaches around 950 million to one billion the spatial pattern of distribution would not seem to be basically different from the pattern which has persistently remained peripheral to the peninsular plateau. Likewise, the pattern of urbanisation would seem to follow the overall pattern of distribution with only 30 to 35 per cent of the total population living in urban centres and the large cities (above 50,000 population) claiming a major proportion of urban population, secondary and tertiary activities and infrastructure facilities and amenities.

The resource structure, spatial pattern of distribution and the emergence of major centres of economic activities based on these resources also bring out marked dualism, but with a difference which is so important in the formulation of any future strategy for evolving an integrated pattern of market towns and production centres in the context of regional development and national planning. Prior to Independence, the forestry, minerals, water and power resources by virtue of their association with certain rock types, rugged terrain and per humid conditions have been virtually peripheries to the pattern of spatial organisation of the economy which was centred on major metropolitan centres/ports, capitals of British Provinces and Princely States. The agricultural areas were hinterlands for export of primary products or for processing leaving traditional market towns with very little of agro-industrial and related activities. In a sense the traditional market towns (weekly and regular markets) functioned effectively as a link to the non-agricultural occupation based on household and cottage industries spread widely in the rural areas. This was evident in the relatively high proportion of workers engaged in non-primary activities prior to 1951. With the improvement in transport net work and the technological development, the rural areas and small towns lost these activities under competition from urban based high cost technology. Likewise major industrial centres located close to their resource-base have developed 'islands' of economic development surrounded by extensive areas of under-development.

Agricultural development has however brought about marked changes in spatial organisation of market towns though such areas are restricted to the relatively uniform alluvial plains with assured water supply. While the market towns have grown both in number and their functional-economic status the emerging pattern of spatial organisation shows increasing evidences of friction as between the requirements of conditions for the emergence of new market towns and their hinterland on the one hand and the expansion of the hinterlands of older and relatively established market towns which have grown as regional economic centres as in the Punjab-Haryana-Western Uttar Pradesh and the Delta area of coastal Andhra Pradesh and the Coimbatore Plateau in Tamil Nadu.

The city-system marked by urban-agglomerations and location along major transport routes has accentuated the dichotomy as between rural and urban into (i) rural-rural, (ii) rural-urban and (iii) urban-urban types with varied patterns of spatial organisation in different regions of the country and hence an uniform strategy for evolving a system of market towns and production centres in the context of regional development and national planning may not be feasible.

Development and Disparities—profiles of the spatial processes and patterns (Appendix I)

Regional variations in the levels of development carried out both from the national and regional angle

can be meaningfully interpreted against the background of the spatial processes of organisation of the economy around a system of nodal centres (market towns, urban-industrial towns and their linkages). The following typologies emerge:

(i) *Contiguous and extensive areas of relatively high level of development with minimum variations within*

These conform to the agriculturally rich areas as in the Punjab-Haryana, Western U.P., Krishna-Godavary delta, Mysore Plateau, Coimbatore plateau and the Cauvery delta. In some of these areas the market towns show a distinct regularity both in spatial distributed and hierarchic pattern of development. A four tier hierarchic pattern of nodality with Delhi at the apex is noticed in the studies of Karnal District in Haryana (Bhat et al 1976) and Muzaffarnagar District in Uttar Pradesh (Rao V.L.S.P. 1976). There are definite indications of the trickle down effect of development impulses with small rural settlements of even 1500—2500 population range acquiring infrastructure facilities and amenities. There are however certain differences in the location and growth of newly created small market centres. Such markets located along radial routes converging on major market town/regional economic centres, as for instance Karnal and Panipat, are by passed by the farmers who prefer to avail of multiple transactions and efficiency in clearing the market arrivals of commodities and spot payment of cash. Such rural-rural differences in the pattern of integration of different size-range of settlements might not be a short-term anomaly. These anomalies are also noticed as between the inner delta area of the Krishna-Godavari tract and the contact zone between the delta and the foot hills in Andhra Pradesh. The latter has emerged as a distinct agro-industrial region with Guntur-Vijayawada-Rajamundry as the facii of development.

(ii) *Linear pattern of development with limited spread effect on the surrounding area*

Such patterns of development have been characteristic of the coastal plains in Karnataka and Kerala. In these areas the pattern of distribution of population itself is elongated conforming to older sand dunes and coastal plains. The transport route also follows the same pattern. While the contiguity of settlements makes it difficult to differentiate the boundaries of different settlements, the differences in levels of functions of different towns and large villages (of over 10,000 persons as in Kerala) is clearly seen in the breaks in the intensity of movement of people and various commercial, social and infrastructure facilities and amenities distributed along the highway passing through the settlements. In a sense the spatial organisation of the economy is linear oriented to market villages and towns. Such a spatial organisation of the economy has rendered the mid-land and foot hill areas of Kerala and parts of coastal Karnataka peripheral areas while their norms of specialisation is rooted to grassland, livestock and plantation economy.

(iii) *Contiguous and extensive areas of low levels of development with weakly developed market towns and/or administrative centres*

These areas are mostly agricultural with very little diversification and intensity of cropping. They extend over parts of the Deccan peninsular comprising Western Madhya Pradesh, Vidarbha (part of Maharashtra), the Central and Northern Bihar, West Bengal, Orissa and the Northern *Maidan* area of Karnataka. The cropping patterns range from cultivation of dry millets, cotton, oil seeds (mainly groundnut) and paddy. The spatial organisation of the economy has inherently a weak agricultural base and does not show well developed hierarchic system of nodal centres.

(iv) *Areas of low levels of development with inherently low agricultural productivity* (*Bhat L.S.* 1972)

These include drought prone areas like the Rayalaseema and the semi-arid red soil plateau of Telangana in Andhra Pradesh and the semi-arid Rajasthan. In these areas urbanisation itself is low with an imbalance in urban hierarchy. Likewise the larger urban-industrial centres like Hyderabad-Secunderabad have very little influence on the surrounding area unlike the case of Punjab-Haryana-Western U.P. tract with reference to Delhi.

(v) *Hilly and Tribal areas of extensively low levels of development with low levels of resource use*

These areas exhibit a variety of spatial patterns of organisation depending on the situation. The Western Ghats region is narrow and elongated and hence the pattern of growth of industrial centres is peripheral to the region proper while within the region contrasts in the distribution of population and cultivated areas (particularly of plantation crops) has brought about sharp variations in the size of market towns. Accessibility and pattern of orientation of inter-regional transport routes has played an important role in the growth and decline of market towns.

The South-East resource region with its major industrial establishments stands out as an example of sharp imbalances in spatial organisation of the economy. Here the industrial centres like Ranchi, Bokaro and Rourkela are oriented more to outside regions and production centres than to the economy of the region. Being an area of forested hills and tribal population dwelling in small rural settlements the number of existing and potential market towns or nodes itself limited. (Sinha S. 1982).

Yet another study of the hill region of Uttar Pradesh presents a pattern of organisation of the economy in which the vicious circle of poverty-outmigration-poverty and the resultant 'money-order economy' have inhibited the emergence of market centres while the major axis linking the plains with the centres of tourist and religious attraction is the only basis of inter-action with the rest of the region. The concept of nodality as the basis of functional organisation has hardly any validity under such a situation. Added to

it is the role of this region as a supplier of primary produce from forests and other resources for processing in the plains. (Dobhal G.L. 1981).

(vi) *Areas of low levels of development to the impact of the Metropolitan cities* (*Deshpande C.D.* 1980)

The impact of the metropolitan city on the surrounding region has brought about marked imbalance in the growth of a system of marked towns and production centres. The impact of Bombay on the Konkan region of Maharashtra has been so widespread that the traditional market towns which used to be the centres of collection and distribution of consumer goods have declined. This is an instance to illustrate how increased accessibility without corresponding economic inputs accentuate the externality of space relations.

Concluding Observations

The typologies of variations in the levels of development as related to spatial organisation of the economy around market towns and production centres presented in the foregoing account are by no means exhaustive and yet serve to reinforce the hypothesis that market towns are the basis of spatial integration of the economy and hence for narrowing the dichotomy as between rural and urban or agriculture and industrial components of the economy. It is also observed that in predominantly agricultural areas the hierarchic organisation of settlements ranging from service centres for a cluster of villages to agro-industrial complexes needs to be formulated as the spatial strategy for development region by region. The range of centres and levels of activities, infrastructure facilities and amenities to be provided in them would however vary according to regional agricultural typologies. Likewise, identification and areal differentiation of natural resources and existing industrial production according to their national, regional and local importance would be a complementary step in formulating a spatial strategy for the location of industrial production complexes. The linkages between the regional hierarchic system of market centres and agro-industrial complexes and the industrial complexes based on natural resources and existing industrial structure would then facilitate the integration of regional development plans in a national framework. Findings of empirical studies on the concept of growth-poles and growth-centres and of central place hierarchy in the context of District and Block level planning carried out in the past need a critical evaluation in this context.

Select References

Alam M. et al ed. (1982)—*Settlement System of India*, Oxford & IBH Publishing Co. New Delhi.

Berry B.J.L. (1967)—*Geography of Market Centres and Retail Distribution*, Prentice Hall, Englewood Cliffs, New Jersey.

Bhat L.S. (1976)—*Micro-level Planning*—A case study of Karnal Area, Haryana, India—K.B. Publications. New Delhi.

Bhat L.S. (1972)—*Regional Planning in India*, Statistical Publishing Society, Calcutta.

Bhat L.S. et al (1975)—*"India" Essays on World Urbanisation*, Ronald Jones (ed), George Philip and Son Ltd., London.

Bronger D. (1978)—"Central Place System Regional Planning and Development in developing countries: Case of India" R.L. Singh et al (ed) *Transformation of Rural Habitat in Indian Perspective*, National Geographical Society of India, Research Publication No. 19.

Desai P.B et al ed (1969)—*Regional Perspective of Industrial and Urban Growth*, Macmillan and Co., Bombay.

Dasgupta Biplab (1971)—"Socio-economic classification of Districts—A statistical approach" *Economic and Political Weekly*, Vol. VI, No.33 pp. 1763—1774.

Deshpande C.D et al (1980)—*Impact of a Metropolitan city on the surrounding region : A study of South Colaba, Maharashtra*. Concept Publishing Company, New Delhi.

Dobhal G.L. (1981)—"Moneyorder Remittances and outmigration—A case study of Pauri Garhwal District"—*Annals of the National Association of Geographers, India*. Vol. 1, No. 2. pp 75-97.

Folke Steen (1968)—"Central Place Systems and Spatial Interactions in Nilgiris and Coorg (S. India)", 21st I.G.U. Congress India, Collected Papers, Denmark.

Ginsburg Norton ed (1960)—*Geography and Economic Development*, University of Chicago, Department of Geography, Research Series.

Government of India, Ministry of Works and Housing (1977)—Report of the Task Force on Planning and Development of Small and Medium Towns and Cities, Vols. I and II.

Misra R.P. et al ed (1969)—*Regional Planning Concepts, Techniques, Policies and Case-studies*. Prassaranga, 1969.

Misra G.K. et al (1980)—*Regional Planning at the micro-level ;* A study of rural electrification in Bastar and Chandrapur. Indian Institute of Public Administration, New Delhi.

Misra R.P. et al (1980)—*Multi-level Planning and Integrated Rural Development in India*, Heritage Publishers, New Delhi.

Mitra A. (1965)—*Levels of Regional Development*, Census of India 1981 Vol. I—Part-I A(i) and (ii).

National Council of Applied Economic Research, New Delhi (1965)—*Market Towns and Spatial Development in India*, New Delhi.

Pal M.N. (1963)—"A method of regional analysis of Economic Development with special reference to South India" *Journal of Regional Science* Vol. 5, No. 1, pp. 41-58.

Ramachandran H. (1980)—*Village Clusters and Rural Development*. Concept Publishing Company, New Delhi.

Rao V.L.S.P. (1978)—*Urbanisation in India; Spatial Dimensions*, Institute for Social and Economic Change, Bangalore.

Rao V.L.S.P. (1963)—*Regional Planning*, Indian Statistical Institute, Calcutta.

Rao, V.L.S.P. (1976)—*Development Strategy for an Agricultural Region*, Institute of Development Studies, University of Mysore, Mysore.

Registrar General & Census Commission of India—Census of India, 1981 : Provisional Population Totals—Rural-Urban Distribution, Paper 2 of 1981.

Sen Lalit et al (1971)—*Planning Rural Growth Centres for Integrated Area Development ;* A Study in Miryalguda Taluka, National Institute of Community Development, Hyderabad.

Sharma A.N. (1980)—*Spatial Approach for District Planning*, Concept Publishing Company, New Delhi.

Sinha Savita (1982)—*Regional Structure, Processes and Patterns of Development : A case study of the Chota Nagpur Region*, Ph. D. Thesis, Bhagalpur University (Unpublished).

Sopher David ed (1980)—An Exploration of India—Geographical Perspective on Society and Culture, Longman, London.

Wanmali S. (1981)—Periodic Markets and Rural Development in India, B.R. Publishing Corporation, Delhi.

Whyte R.O.—The Spatial Geography of Rural Economics, Oxford University Press, Bombay.

APPENDIX I

India: Patterns of regional and urban development—Selected examples

Region	Districts	Index Values*					Percentage Income Originating from		
		Overall development	Agrl. development	Development of secondary activities	Development of tertiary activities	Urban development	Primary	Secondary	Tertiary
1	2	3	4	5	6	7	8	9	10
1. *Relatively developed regions*									
COIMBATORE PLATEAU	Coimbatore	1.69VH	1.01H	1.60VH	1.30VH	1.37VH	36.95	24.48	38.57
	Salem	1.14M	1.02M	1.25H	1.09H	1.19H	49.65	20.42	29.93
	Madurai	1.41H	1.08H	1.38VH	1.31VH	1.40VH	39.91	18.58	41.51
KRISHNA-GODAVARI DELTA	E. Godavari	1.31H	1.15VH	1.29H	1.16H	1.28H	55.42	12.99	31.59
	W. Godavari	1.19H	1.16VH	1.29H	1.11H	1.22H	59.07	9.53	31.35
	Krishna	1.22H	1.09H	1.22H	1.14H	1.35VH	57.63	7.31	35.06
	Guntur	1.24H	1.12H	1.45VH	1.04M	1.27H	61.03	14.90	24.07
PUNJAB PLAINS	Ludhiana	1.80VH	1.19VH	1.42VH	1.31VH	1.50VH	32.56	14.26	53.18
	Patiala	1.38H	1.14H	1.19H	1.19H	1.26H	46.26	7.86	45.88
	Jullunder	1.81VH	1.17VH	1.48VH	1.30VH	1.42VH	31.05	23.25	45.70
2. *Low level of development and low resource potential*									
TELANGANA	Adilabad	0.88L	0.85VL	1.02VH	1.00M	0.89M	37.43	23.66	38.91
	Nizamabad	1.09M	1.04M	1.34VH	0.95M	1.12M	44.94	27.28	27.28
	Karimnagar	1.10M	0.94L	1.14H	1.12H	0.79L	32.75	29.25	38.00
	Warangal	1.02M	0.93L	1.25H	1.06M	1.13H	39.98	17.73	42.29
	Khammam	0.87L	0.95M	0.82L	0.92M	1.01M	47.22	21.28	31.50
	Medak	0.83L	0.94L	0.84L	0.93M	0.79L	44.56	19.47	35.97
	Hyderabad	1.93VH	0.91L	1.34VH	1.69EH	1.69VH	11.76	8.10	80.14
	Nalgonda	0.91M	0.91L	0.86L	1.00M	0.96M	41.79	17.87	40.34
	Mahbubnagar	0.86L	0.90L	0.90M	0.91L	0.80L	49.86	15.87	34.27
MARATHWADA	Aurangabad	0.77L	0.88L	0.94M	0.90L	1.03M	55.44	11.71	32.85
	Parbhani	0.77L	0.87L	0.87L	0.96M	0.89M	51.63	8.79	39.58
	Bhir	0.71L	0.88L	0.69L	0.84L	0.83L	61.13	6.96	31.91
	Osmanabad	0.72L	0.85L	0.63VL	1.11H	0.83L	30.16	3.30	66.54
	Nanded	0.77L	0.82L	0.99M	0.99M	1.04M	43.99	15.75	40.26
3. *Low level of development and high resource potential*									
SOUTH-EAST RESOURCE REGION	Bilaspur	0.75L	0.97M	0.85L	0.73VL	0.93M	71.60	6.26	22.14
	Raipur	0.81L	0.97M	0.98M	0.84L	1.05M	65.08	8.97	25.95
	Surguja	0.65L	0.92L	0.55VL	0.54VL	0.57VL	70.89	12.78	16.33
	Sidhi	0.58VL	0.82VL	0.59VL	0.50VL	0.34VL	82.33	4.96	12.71
	Bastar	0.63L	0.91L	0.54VL	0.47VL	0.52VL	83.27	5.80	10.93
	Koraput	0.74L	0.86L	0.57VL	0.94M	0.66VL	58.24	6.07	35.69

Note : EH — Extremely high
VH — Very high
H — High
M — Medium
L — Low
VL — Very low

(Source : For income, National Council of Applied Economic Research, Inter-district and Inter-State Income Differentials: 1955-56, New Delhi, 1963).

35—5 RGI/ND/84

PAPERS OF SESSION IV

UTILIZATION OF THE LABOUR FORCE IN PAKISTAN: SOME STRUCTURAL FEATURES

NASRA M. SHAH AND GHULAM MUJTABA MIRZA

In Pakistan's largely agricultural economy where a great deal of economic activity takes place outside the formal sector, it has traditionally been difficult to measure the adequacy of labor utilization. This has been so both because of conceptual and data limitations.[1] At the conceptual level, some of the indices which have been used for measuring underemployment (or underutilization) include the number of hours worked by employed persons, and the percentage of labor force which is not paid any cash (or kind) wages for its services. Also, productivity of the labor force within different sectors of industry has been used as an indicator of underemployment (e.g. Robinson and Abbasi, 1979; Farooq, 1975). Other aspects of labor utilization such as adequacy of wages or the congruence between a person's education and occupation have not been studied, mainly due to non-availability of data.

Most studies of Pakistan's labor force deal with trends and structure of employment itself rather than with the quality of employment in terms of 'adequacy' of labor utilization. Similarly, the extent of unemployment has not been well studied, mainly because of the tenuous nature of this concept, particularly in the rural areas of Pakistan. The family farm has a rather large capacity for absorbing additional labor force entrants and the only person who are likely to be reported as unemployed (i.e. 'those who are looking for work') are those who are landless or are involved in specific non-agricultural activity. A third group of unemployed persons consists of those who have attained a certain level of education and expect to obtain non-rural and/or non-agricultural jobs but have not succeeded in doing so.

In this article, we hope to provide a somewhat more comprehensive view of labor utilization in Pakistan than has been available to date. We have done this with the help of the labor utilization framework suggested by Philip Hauser (1974, 1977) and extended by Sullivan (1978) and Clogg (1979). Hauser's framework calls for more comprehensive data than the standard labor force approach which provides information only on the employed and unemployed components of the labor force but does not usually deal with the adequacy of employment. The essence of Hauser's framework consists of going beyond the standard labor force approach in its attempt to measure the quality of employment in terms of whether a person works an 'adequate' number of hours, earns a 'reasonable' level of income and is employed in an occupation which is commensurate with his/her training and education. The relevant labor force data are classified as follows for the measurement of labor utilization:

Total work force:

- Utilized adequately
- Utilized inadequately
  - By unemployment
  - By hours of work
  - By income level
  - By mismatch of occupation and education

After separating the unemployed from employed persons, the latter are broken down into those who are working full time and those who are working less than full time involuntarily. Those who are employed full time are then disaggregated into whether they earn sufficient income or not. Finally, among those who are earning a sufficient income, a decision is made about whether the person's occupation is commensurate with his/her education and training or not. Thus, the framework measures underutilization of labor along four dimensions, defined to be mutually exclusive.[2] It tells us something about how well the labor force is doing in terms of working a desirable number of hours, earning a desirable amount of income and securing jobs which are befitting to a person's training.

While Hauser's framework provides a more comprehensive picture of the quality of the labor utilization, it suffers from some inherent conceptual problems. The criterion that a researcher has to use in order to define the 'reasonableness' or 'sufficiency' of hours of work and income may be arbitrary and judgemental, thus affecting the validity of results. Similarly, it is difficult to define the 'mismatch' between education and occupation, particularly in a country where literacy and educational attainment are very low and the majority of jobs fall within the informal sector. One of the reasons for this is that many of the informal sector jobs such as weaving, tailoring and cooking may be learned informally through relatives and do not require formal education. For example, the educational level of a woman

[1] For a discussion of these problems, see Shah and Sathar, 1978; Shah, Shah and Ahmed, 1977; Irfan, 1981.

[2] While the basic framework defines these four categories to be mutually exclusive, it is possible to measure the 'overlap' of underutilization across the various categories. Clogg (1979) has done extensive analysis of the U.S. labor force in which he has done this. In the present paper, we have not made an attempt to study the overlap between various categories.

who is self-employed as a tailor may not have any relevance to her occupation and may not affect her income at all. The concept of mismatch has a greater amount of relevance for formal sector jobs which have certain educational level requirements. Despite some of the shortcomings mentioned above, we believe that Hauser's framework provides a more comprehensive and valuable description of the labor force than the simpler labor force approach.

Data

Pakistan has traditionally collected labor force data through censuses and labor force surveys. The present paper is based primarily on data from the 1973 Housing, Economic and Demographic (HED) Survey. The HED Survey was conducted as a supplement to the 1972 Census and was designed to provide data on economic, educational and migration characteristics which the overall Census or 'Big Count' did not include. The HED sample consisted of about 255,000 households, 48 per cent in urban and 52 per cent in rural areas (Pakistan Census Organization, n.d.). The sample was weighted by province and rural-urban areas and the published data represent the absolute numbers for the country.

Ever since the HED survey computer printouts became available, there has been a considerable debate within and outside the country about the quality of its data. The labor force data, particularly for females, has been the subject of much criticism and controversy. Also, the HED Survey seems to have underestimated both the total population and the civilian labor force, the former perhaps by 8-9 per cent assuming that the 1972 Census figures are correct. The published labor force data indicates that over half of the females in the civilian labor force (CLF) were unemployed at the time of the survey—a highly suspect finding. In the face of all these shortcomings it may seem a little foolhardy to attempt an analysis of the very variables which have been the focus of criticism. However, we have at least three good reasons for our apparent fool—hardiness. First, we have been able to provide alternate labor force estimates to the published ones on the basis of some consistency checks we made on the HED Survey tape. The alternate estimates certainly seem more reasonable. Second, the validity of HED Survey data deserves to be probed further since it is a potentially valuable body of data and should not be dismissed without adequate scrutiny. It is for this reason that we have compared HED Survey data with other sources to the extent possible. Third, we have been able to provide a relatively much more detailed analysis of various aspects of labor utilization than has been possible before. This has been achieved by the help of rather complex cross tabulations required for a more meaningful analysis.

In our effort to use Hauser's framework, we have analysed three dimensions of underutilization, namely unemployment, hours of work and mismatch of education and occupation. Data on income were not available from the HED Survey and this dimension could therefore not be included in the analysis.[3] For hours of work, any person who worked less than 40 hours has been defined as inadequately utilized. The HED Survey did not collect data on whether the persons worked less than 40 hours voluntarily or were forced by circumstances to do so. Thus, we cannot analyse whether underutilization by hours is involuntary or not. Consequently, our estimates of underutilization by hours may be somewhat over estimated. The choice of 40 hours is somewhat arbitrary and was selected largely because of international comparability. It may be reemphasized that the measurement of hours of work in the informal sector may be subject to a large amount of error since the hours of work may vary by seasons and since the schedule of work may be generally flexible.

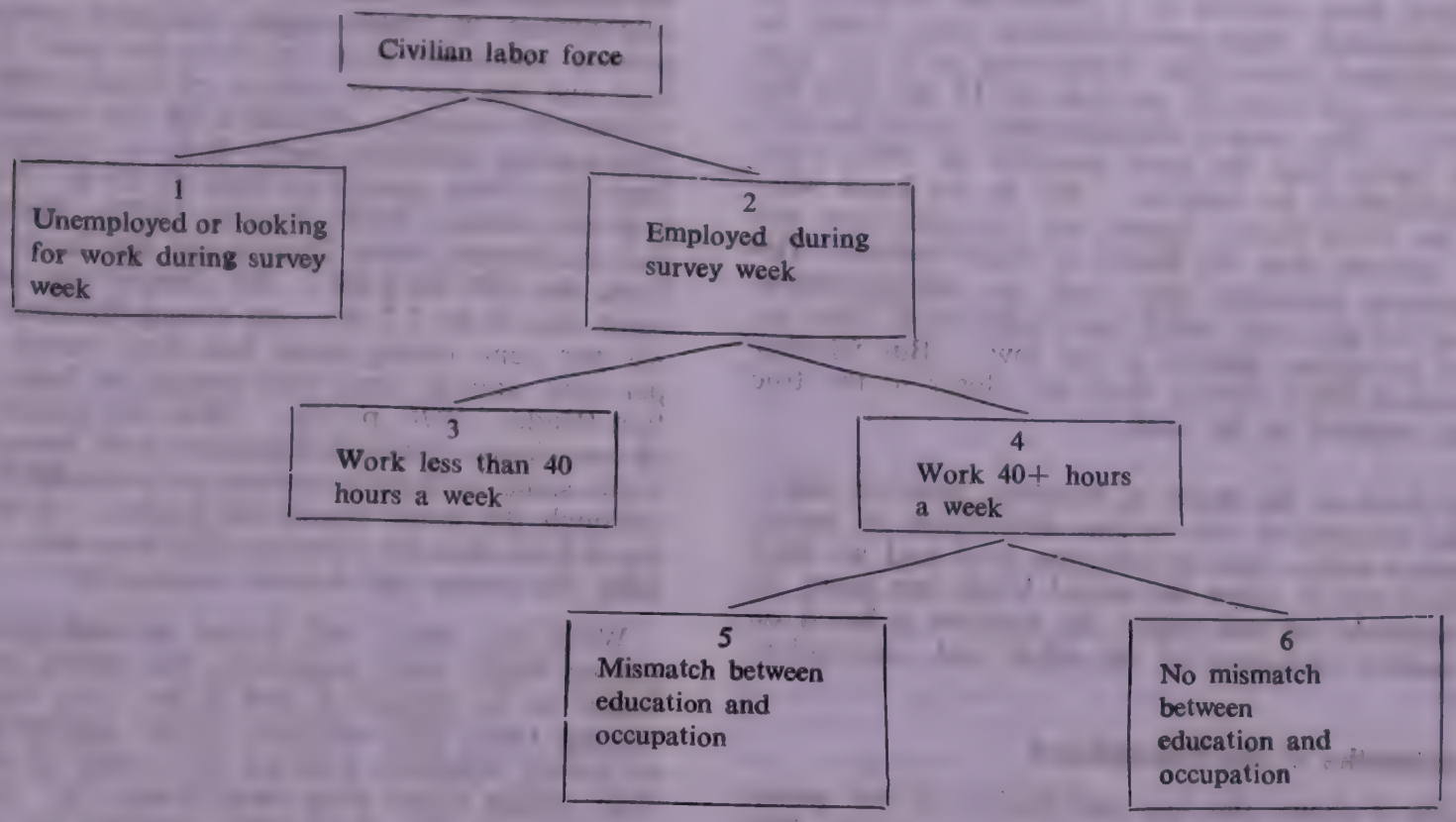
We defined as mismatched any person within an occupational group who had an education (i.e. grades of formal education) higher than the mean education of the persons in that occupation.[4] A summation of mismatch in the seven broad occupations was used in order to arrive at an estimate of total mismatch among various groups such as rural or urban males and females. As discussed above, the concept of mismatch is difficult to apply in situations where a large proportion of the labor force is engaged in informal sector activity. Furthermore, the analysis of mismatch within broad occupations only provides a very crude estimate of whether a person's education and training are being adequately utilized. For example, the broad occupational category of professional, technical and related workers includes such diverse occupations as a medical doctor and a midwife—the former requiring at least 17 years of education while the latter requires only certain skills learned from one's

[3]Data on income are not collected as part of censuses of labor force surveys. We are currently in the process of analyzing utilization of the labor force from the 1977 Rawalpindi survey, conducted by Pakistan Institute of Development Economics, which includes analysis by income.

[4]Our estimate of mismatch would have been smaller if we had included only those persons who were one standard deviation above the mean, as done by Hauser (1974, 1977).

mother or other experienced females. Thus, the proportion of persons who are mismatched within an occupational group is hard to interpret. Our calculation of mismatch should therefore be treated as an indication of the broad order of magnitude rather than a precise estimate of this phenomenon, the reliability of which should be checked as more refined data become available.

To summarize, our analysis is defined as follows :



Persons who fall in categories 1 or 3 or 5 are defined as the inadequately utilized component of the labor force; those in categories 2 and 4 and 6 are defined as the adequately utilized component.

RESULTS

The three dimensions of labor utilization, namely unemployment, number of hours worked and mismatch have been analysed in relation to several demographic correlates such as age, sex, education and marital status. In addition, data on the percentage of unpaid family helpers has been analysed in order to partially compensate for the non-availability of income data. After a discussion of underutilization specific to each of the three dimensions, an overall assessment of the percentage of adequately utilized labor force is presented in relation to sex and rural-urban residence.

The absolute numbers of males and females in the civilian labor force are shown in Table 1, together with their current employment status. About 12.8 million, or 29.8 per cent, of the total population were in the civilian labor force in 1961. This number grew to about 19.8 million (or 32.7 per cent of the population enumerated in HED Survey), according to the published HED Survey data. Upon a closer examination of the data, we found that about 1.89 million persons (1.13 million men and .76 million women) had been erroneously included in the civilian labor force and that they were actually not working or looking for work. Furthermore, we found that all of the non-working persons who had been erroneously included had been added to the unemployed component of the labor force. We therefore recalculated our figures after excluding the non-working persons. The result was that the absolute number of CLF was reduced to 17.9 million which constitutes 29.5 per cent of the enumerated HED Survey population. While the revised (absolute) number is an undercount of the total labor force, its magnitude (in relation to the HED Survey population) seems much more reasonable when one examines the trend in activity rates of the population in Pakistan, than the published figure. Historically, about 30 per cent of the total population in Pakistan has been reported to be in the labor force according to various census and labor force surveys; about 2 per cent of it being female.

Among females age 10 and over, about 8—10 per cent have traditionally been reported to be in the labor force. Data from household surveys has shown, however, that the labor force participation rates of females may have been grossly underestimated in censuses and labor force surveys and that the actual participation rates are probably around 18—20 per cent or higher (Shah and Shah, 1980). Data on female labor force participation in Pakistan leave much to be desired and are plagued by conceptual as well as measurement errors discussed elsewhere (Shah and Shah, 1980). With regard to underutilization, data have rarely been published by sex thus

discouraging detailed analysis. It is hoped that the following analysis will fill some of this gap in our knowledge.

With regard to our revised estimates of unemployment, the exclusion of the non-working persons from the labor force resulted in a substantial reduction of the ridiculously high unemployment rates found in the published data—from 9 per cent to 3 per cent for males and from 52 per cent to 15 per cent for females. The revised unemployment rates are still much higher than the rates provided by other sources, particularly for females. We do not know whether the HED Survey figures on unemployment are more accurate than the figures in other sources. Demographers generally agree that the unemployment rate of 1-2 per cent which has traditionally been reported in various sources is too low. But whether the revised HED Survey rates are closer to the true figures remains to be seen.

Our focus in this paper is, however, more on studying the patterns of the various dimensions of underutilization rather than its absolute level and we shall therefore not be labor the actual levels any more. In the remainder of this paper, the analysis is based on our revised estimates of the CLF and unemployment.[5]

Characteristics of the Unemployed

Table 2 shows the age distribution of the unemployed males and females from various sources. The general pattern for males in all three sources is similar. That is, younger men, particularly those aged less than 25 had consistently higher unemployment rates than older men. Such a pattern is consistent with data from other developing as well as developed countries. The 1961 rates pertain to the non-agricultural labor force only and are therefore not strictly comparable with HED Survey and 1974-75 Labour Force Survey (LFS). The HED Survey rates are about twice as high as the LFS rates for males. The similarity of age patterns of unemployment (among males) between the various sources suggests that while HED Survey rates are perhaps higher (which may be accurate) they are reliable insofar as they are consistent with the other sources.

In the case of females, the age pattern is somewhat erratic. Comparison with the other sources is made difficult because LFS provides rates only for one age group and the 1961 Census data pertain only to the non-agricultural labor force. One conclusion that can nevertheless be made is that even after our correction, the female unemployment rates are exceptionally high and should therefore be interpreted with caution. The absence of the familiar age pattern of unemployment raises some doubt about the validity of these rates.

When controlled by education, the unemployment rates among males were found to be positively associated with educational level. About 2 per cent of the illiterate males were unemployed compared to 4 per cent of those with less than matric (ten grades of education) and 9 per cent of those with matric or more. The unemployment rate was particularly high (21 per cent) among single (who are likely to be younger also) males. A higher unemployment rate among the more highly educated persons is a pattern which has been found in the labor force surveys and has been the subject of considerable debate within the country. Estimates of the unemployment rate among graduates (with B.A. or higher education) have been placed as high as 25 to 30 per cent (e.g. see Anwar, 1973; Nawaz, 1973). Rado (1976) has challenged these figures on the basis of data from the 1971-72 LFS. He showed the unemployment rate to be 1.7 per cent among illiterate persons, 2.8 per cent among those less than matric and 4.3 per cent among those with matric or higher education (Rado, 1976, p. 10). Thus, the general pattern of association between education and unemployment is the same in Rado's analysis as in the HED Survey, although the latter figures are higher. It should be noted here that the relevant LFS data were not available for males and females separately.

When the rural and urban unemployment rates among males were compared, the urban rates were found to be higher—2 and 6 per cent respectively. Among those with relatively higher education (matric or more), however, a larger percentage of the rural than urban males were unemployed—10 and 8 per cent respectively. Both these findings are consistent with data from the 1974-75 LFS calculated by the Planning Commission, which found the rural rates to be 1.3 per cent and urban rates to be 2.7 per cent for both sexes combined. Again, single males with matric or higher education had very high unemployment rates, 23 per cent in rural and 19 per cent in urban areas.

Patterns of unemployment among females were not as clear and consistent as among the males. Education did not seem to have the expected positive association with the rate of unemployment except among single rural women. One other finding worth noting is the relatively very high rates of unemployment among divorced women in both rural and urban areas, particularly those who were illiterate. Half of the divorced illiterate women in rural areas and 57 per cent in urban areas were reported to be unemployed. That is, they were in the labor force and were looking for work. Divorced illiterate women do represent a group which may have a particularly acute need for finding work and these high unemployment rates may perhaps be accurate. Our earlier analysis of the HED data suggest that labor force participation among divorced and widowed women is significantly higher than among other women.[6] Participation rates were unusually high among certain subgroups of divorced women such as the urban household heads, 46 per cent of whom were employed. Furthermore, divorced illiterate women in

[5] It should be noted that the published figures for currently employed persons do not contain any such errors. Our estimate of the total currently employed persons is the same as the published estimate.

[6] Participation rates among divorced and widowed women are 9 and 6 per cent compared with 4 per cent each among single and married women.

urban areas had a much higher participation rate than all illiterate women—17 per cent and 4 per cent respectively (Shah and Smith, 1981). While the above findings about the higher unemployment rates among divorced women are interesting and suggest some policy implications, we must be careful in interpreting our results in the absence of comparable data from other sources.

In summary, the HED Survey rates of unemployment seem to be much more reliable for males than for females. The overall unemployment rate of 3.2 per cent among males probably has a high degree of reliability. The rate of 15 per cent among women, however, does not compare well with other sources and seems more suspect.

Unpaid Family Helpers

Participation in the labor force without any cash (or kind) remuneration represents another dimension of the underutilization of labor. This phenomenon continues to effect a large number of women and young children, particularly in rural area. About 19 per cent of the employed persons were reported to be working as unpaid family helpers in 1961; the percentage was higher in both HED Survey and 1974-75 LFS, 24 per cent and 28 per cent respectively (Table 4). The figures for females in the country who were unpaid family helpers were close in 1961 Census and 1973 HED Survey—about 59 and 55 per cent respectively. The percentage of rural females employed as unpaid family helpers in agriculture was remarkably close in the above two sources, about 76 per cent in each. Thus, three-fourths of the women who were engaged in agricultural activity were not paid for their labor. Of the total female labor force, about 73 per cent was engaged in agricultural activity in the HED Survey, and thus about 55 per cent of all the female workers in rural areas were not paid for their work. When the female labor force is considered as a whole, about 60 per cent of all women were unpaid family helpers. In a country where female work participation is relatively low, the lack of remuneration itself may be a reason for not working, or being reported as not working.

The male-female differential in percentage of unpaid family helpers was large. Four times as many females than males were in this category in 1961 and about two and a half times as many in 1973 (Table 4). On the other hand, a little over one-fourth of the rural males were unpaid family helpers in 1961 as well as 1973; the corresponding figures for urban males were 6 and 10 per cent. The large differential between males and females clearly indicates that a much larger proportion of female than male labor is underutilized. We believe that in a large majority of the cases where workers are not paid for their labor, they can hardly be expected to have a high work commitment. Majority of the females in Pakistan are probably in the labor force because of economic necessity rather than because the work provides non-economic satisfaction or is considered a valued role.

Finally, comparison of various data sources once again indicates that the HED Survey data on unpaid family helpers is quite closely comparable with other sources, and we have no reason to suspect its reliability.

HOURS OF WORK

The number of hours that a person engages in economic activity during a day, or week, is probably a significant element in the productivity of the labor force. If insufficient work is available and individuals are not able to work the 'desirable' or 'desired' number of hours, their services are likely to be underutilized. The measurement of hours of work is, however, subject to several problems, as mentioned earlier. Among illiterate populations where people do not have a very concise idea about time (measured in hours), this variable may be difficult to measure accurately without considerable probing. Also, in a predominantly agricultural economy in which several members of the family may be working together on the farm, assignment of hours to each may be highly imprecise, if not impossible. Furthermore, the quantitative hours of work do not tell us anything about the quality or intensity of services rendered. Finally, the productivity of the agricultural labor force may vary significantly not only according to the number of hours of input but also according to other factors such as mechanization, availability of irrigation water, tenure status, etc.

We found that Pakistani males work 49 hours a week on the average, roughly the same amount in rural and urban areas (Table 5). Average hours of work reported in the 1974-75 LFS (49.9) are very close to the HED Survey, although the former pertain to both sexes together. Thus, the HED Survey findings once again seem fairly reliable. The reported hours of work are much smaller for females than for males—only 35.5 compared with 49.0. This perhaps indicates that more of the women work part time than men. The lower hours of work for females could, however, simply be the result of biased reporting on the part of the male respondent who answered the labor force questions for the females in his family.[7]

When age was controlled, younger men (< age 25) were found to work fewer hours compared to those aged 25—44—46.1 and 51.0 hours respectively. The patterns were similar within rural and urban areas. In terms of marital status, currently married men had

[7]In cases where the woman herself probably answered the questions about her economic activity, she is equally likely to have underreported the hours because of the same reasons as apply to the male, namely illiteracy; the difficulty to separate the number of hours spent by each member of the family in joint activity; and the general notion that the male is the major labor force participant while a woman is only his helper. Since the HED Survey used male enumerators an overwhelming majority of the respondents are therefore, likely to have been male.

the highest hours of work while divorced men had the lowest among all age groups; this was true within both rural and urban areas. The unusually low hours worked by the very young (<age 25) and relatively old (≤45) divorced men—37.5 and 36.0 respectively—is interesting and needs to be probed further. It is likely that these men had fewer family responsibilities and therefore a lower need to work full time. Or, there could be other reasons (such as a disability) which could have been the reason for both their divorce and their unusually low hours of work.

As among males, divorced women worked the smallest number of hours among all marital statuses. Divorced women aged 25—44 worked 30.8 hours while those aged 45 + worked only 23.1 hours. It may be recalled from the section on unemployment that divorced women have higher participation rates than other women, and a much higher percentage of them are unemployed. The smaller number of hours worked by them is therefore somewhat surprising. It is possible that it is more difficult for divorced women to find full time jobs because of the stigma attached with divorce. Any conclusion about this, however, must await further validation of the data on hours of work; comparable data are not currently available from any source.

Analysis of hours of work by the respondents' education indicates that among males, the number of hours decreased with the level of education (Table 6). Those who had completed matric or higher education, worked 44.6 hours, on the average, while illiterate men worked 49.7 hours a week—a difference of over 5 hours. The difference was larger in rural than in urban areas. The fewer hours worked by the relatively educated males is likely to be a result of the larger percentage of such males employed in the formal sector where hours of work are fixed. In a usual office job, persons are required to work about 39 hours a week. Thus, illiterate men work longer hours than the educated men but we do not know whether their longer hours of work is accompanied by higher income or not.

In the case of women, there was a curvilinear pattern of relationship between education and hours of work. Illiterate women as well as those with matric or higher education worked longer hours (36.5 each) compared with women who had an education less than matric —23.1 (see Table 6). In urban areas, illiterate women worked more than 40 hours while women with 1—9 grades of education worked only 27.3 hours a week; those with matric or higher education again worked longer hours—38.2. Two explanations for this curvilinear pattern seem reasonable. First, illiterate women probably work longer hours because of their economic need which forces them to be in the labor force; those with some education, however, belong to relatively more affluent families who can afford to work part time. Second, a large proportion of women with matric or higher education are in formal sector jobs which require full time work. What these explanations assume of course is that the data on hours of work by different educational level are accurate. As mentioned before, we cannot check the reliability of these data in the absence of similar data from other sources.

The hours of work are further examined in Table 7 according to the occupations of men and women. In general, males who were engaged in 'white collar' occupations worked fewer hours than sales, agricultural or production workers. The professional and technical group as a whole worked only 37.4 hours compared with 50.8 hours worked by those in sales, and 50.3 hours worked by agriculturists. Among service workers, male maids and housekeepers worked almost 52 hours a week while females worked only 44.2 hours. Note that even in this occupation, which is composed of a substantial proportion of females, women worked fewer hours than men which seems improbable. The only three occupations in which males and females worked roughly the same number of hours consisted of medical doctors, nurses and primary school teachers; in all other occupations, females were reported to work much fewer hours than males. The fact that the hours of work for females in these white collar formal sector jobs were more accurately reported perhaps indicates that in other occupations there is no reason to believe that females actually worked much fewer hours than males; and that their hours of work were almost certainly underreported by the male household head who provided this information.

To summarize, a majority of the men work well over 40 hours a week on the average. A relatively small percentage of them are therefore underutilized in terms of hours of work (as shown later in Table 9). Data on female hours of work do not seem reliable and we believe that women generally work longer hours than is reported in the HED Survey. Our belief is also supported by some studies on women's economic activity in rural areas (e.g. Khan and Bilquees, 1976; Saeed, 1966).

Mismatch between Education and Occupation

It may be recalled that mismatch was defined to represent the apparent incongruity between a person's training and education and his/her occupation. Table 8 shows the percentage of persons in different occupational groups whose education and occupation were mismatched. Some of the problems with our definition of mismatch have been discussed earlier and the findings in Table 8 and 9 are therefore intended to represent the relative orders of magnitude between various groups rather than firm estimates of mismatch within each. The main findings are as follows. First, for the country as a whole, about twice as many men were in the mismatched category as women—about 25 per cent and 12 per cent respectively. Second, the percentage of both men and women who were in the mismatched category was significantly higher in urban than in rural areas. Third, the percentage of persons in the mismatched category was much higher in the 'white collar' and 'blue collar' occupations than in the agricultural, service or production occupations. Finally, the lowest percentage of

mismatched occupations was that in agriculture while the highest percentage was in clerical and related occupations; this was true for both male and female occupations.

Intuitively, all of the above findings seem reasonable. Mismatch may be expected to be higher in urban areas since the diversity of occupations and the consequent probability of a mismatch is much higher in urban than in rural areas. Also, most of the white and blue collar jobs are located in urban areas. Similarly, majority of the highly educated persons are located in urban areas. Mismatch is likely to be relatively low in agricultural occupations because this occupation does not essentially require any education. Both the educational level and occupation of agriculturalists are fairly homogenous groups which minimizes the chances of a mismatch.

Underutilization of Labour in Pakistan

So far, we have focussed on each of the dimensions of labor utilization separately. In Table 9, we present a summary profile of the adequacy of labor utilization according to Hauser's framework. The absolute numbers in column 1 are based on our revised calculations. For the country as a whole, about 59 per cent of the labor force was adequately utilized while the remaining 41 per cent was inadequately utilized either because of unemployment (3.8 per cent) or low hours of work (18.8 per cent) or mismatch of education and occupation (18.8 per cent). The summary in Table 9 is incomplete since no information on income was included. We know that a substantial proportion of Pakistan's population lives below the poverty line (e.g. Naseem, 1973) and inclusion of income data would have certainly increased the underutilized percentage of the labor force.

The difference between the male and female level of underutilization was striking—only about 35 per cent of the latter were adequately utilized compared with 61 per cent of the former. While a smaller percentage of the female labor was underutilized according to mismatch,[8] a significantly larger percentage was underutilized according to unemployment and number of hours worked. Forty six per cent of the female labor force worked less than 40 hours compared with only 17 per cent of the male. Similarly, three times as many females were unemployed than males—15 and 3 per cent respectively. Problems with both of these variables have been discussed above. If our data represent the true picture, however, a lot remains to be done in order to improve the adequacy of female labor.

When rural and urban areas were compared, more of the male labor in urban than in rural areas was found to be underutilized. More of the urban than rural males were unemployed (6 and 2 per cent respectively) and more than twice as many males in urban areas were mismatched than in rural areas (33 and 15 per cent respectively). The net result of these differences was that 64 per cent of the rural but only 47 per cent of the urban male labor was adequately utilized. The pattern for female labor was the same although the differential between rural and urban areas was much smaller.

When labor utilization patterns for Pakistan were compared with other Asian countries we found that like in Pakistan, female labor is less adequately utilized than male labor in Thailand, Philippines and Singapore (Hauser, 1977). The major differences in those countries occur because of a large percentage of inadequately utilized female labor in terms of hours of work and income. In Thailand, for example, 61 per cent of the female labor was inadequately utilized in terms of income compared with 41 per cent of the male labor. In the Philippines, a larger percentage of the female than male labor was underutilized in terms of hours—18 and 7 per cent respectively. In the Philippines again, a larger percentage of the urban than rural labor was inadequately utilized (53 and 41 per cent respectively), a finding which is similar to Pakistan (Smith and Domingo, 1977). This similarity of patterns with other countries lends credibility to our analysis, and suggests that we have at least measured the general pattern in labor force underutilization accurately. As more recent data become available, our analysis can be updated and validated further.

Summary and Conclusions

This paper had two objectives. First, to analyse various dimensions of labor utilization according to Hauser's conceptualization. We examined three aspects of underutilization, namely, unemployment, insufficient labor input in terms of hours of work and incongruity or mismatch between a person's education and occupation. We could not include income, an integral dimension of Hauser's framework, in our analysis due to non-availability of data. Each of these dimensions was analysed in relation to relevant demographic and social factors to examine the structure of underutilization. The second objective was to make a careful check of the reliability of the 1973 Housing, Economic and Demographic (HED) Survey data, on which our analysis is based, by comparing it with other sources. In general we found that our revised estimates of the labor force were very reasonable in terms of participation levels, age structure of the employed, and unemployment rates among the educated. The reliability was much higher for the male than female data.

Our main findings about the structural patterns of underutilization of labor in Pakistan are as follows. First, unemployment was generally found to be much higher among younger males, aged less than 25; the age pattern of unemployment was somewhat erratic for females. Second, there was a positive association between education and the unemployment rate, at least for males. The unemployment rate was 9 per cent among men who had matric or higher education compared with only 2 per cent among illiterate men.

[8] A lower mismatch among women compared to men is consistent with the lower level of literacy and education among them.

The pattern of unemployment according to education was again not very consistent for females. Third, the percentage of persons who worked as unpaid family helpers was much higher for females than for males—55 per cent and 22 per cent in the HED Survey. All of the above findings for males are consistent with earlier studies based on other sources.

Fourth, the average number of hours of work was 49.0 for males and 35.5 for females—a large difference indeed. We have argued that the female hours of work seems to have been underreported by the respondent who in most cases was probably the male household head. Males in white and blue collar occupations worked fewer hours than males engaged in agricultural or production work. Similarly, males who had some education worked fewer hours than illiterate males. Despite these differences among groups, an overwhelming percentage (about 83 per cent) of the male labor was adequately utilized in terms of hours; the corresponding percentage for females was only 54 per cent.

Fifth, the occupation of about 18 per cent males and only 4 per cent females was incongruous with their education. This mismatch of occupation and education was higher among urban than rural males and females. We believe that the higher mismatch in urban areas results from a greater amount of heterogeneity in occupations as well as education within urban area. A second reason is the predominance of formal sector jobs in urban area. Most of the educated persons who do not always find jobs commensurate with their training are located in urban areas.

Finally, when all three dimensions of labour utilization were viewed together, we found that the labor of about 61 per cent of the males and only 35 per cent of the females in the civilian labor force was adequately utilized. Among the females, the major reasons for underutilization were insufficient hours of work and unemployment. Among males, the major reasons were insufficient hours of work and mismatch of education and occupation. In general, a larger percentage of the rural than urban labor force was adequately utilized. Many of the patterns of underutilization in Pakistan were similar to those in other Asian countries which lends credibility to our finding.

On the basis of the above findings, what conclusions can we make for future research and policy? One of the most immediate needs is the availability of comparable labor force data from the 1981 Census. While we have a fairly high degree of confidence in the HED Survey data for the male labor force, we are much more skeptical about data for female labor force. The results for the latter must therefore remain tentative until comparable data from other sources becomes available. Additional data on income is also essential for a more complete analysis of labor utilization.

If the HED data for females are accurate, a lot needs to be done to improve the situation of the female labor force. The status of the female worker seems to have deteriorated tremendously in terms of unemployment. Also, they seem to work much fewer hours than males which may affect their income adversely. Employment of about 60 per cent of the female labor force as unpaid family helpers also leaves a lot to be desired. While it would be ludicrous to suggest that females working on family farms should be paid for their services, it would be desirable to quantify the contribution of their labor to the national economy. It is also necessary to encourage programs which will provide remunerative work and thus provide an alternative to being employed as unpaid family help. This is currently being attempted by the Women's Division to some extent.

Finally, there is a need to formulate policies which would ensure full-time employment to those who seek it and jobs which provide an income sufficient for a reasonable standard of living. There is also a need to reduce the mismatch between education and occupation by tailoring the education system to the overall needs of the labor force. The achievement of all these goals seems quite distant, with at least 41 per cent of the labor force still in the underutilized category.

Table 1 : Civilian labor force (age 10+) and its employed and unemployed components by sex, various sources, Pakistan

Sources	Male			Female		
	Civilian Labor Force	Percentage		Civilian Labor Force	Percentage	
		Employed	Unemployed		Employed	Unemployed
1961 Census	11,641,016*	98.2	1.8	1,122,008	99.4	0.6
1973 HED Survey						
Published	18,016,181†	90.7	9.3	1,745,797†	48.0	52.0
Revised	16,881,545‡	96.8	3.2	983,981‡	85.1	14.9
1974-75 LFS	19,031,327§	98.2	1.8	1,398,446§	99.3	0.7

Sources : *Home Affairs Division (n.d.), Vol. 3, p. V-12.

†Population Census Organization, n.d., p. 222.

‡Author's tabulations from HED Survey tape after excluding persons who had been erroneously included in the civilian labor force as reported in published data.

§Calculated from Statistics Division (n.d., p. 51), assuming a total population of 69.23 million.

Table 2 : Unemployment rates by age and sex, various years (as per cent of the civilian labor force)

Age	1961*		1973 HED†		1974-75 LFS‡	
	Male§	Female§	Male§	Female	Male	Female
Total	3.8	1.7	3.2	14.9	1.8	0.5
10—14	10.9	4.9	8.0	8.0	3.6	na
15—19	8.6	2.7	7.6	16.4	4.0	3.2
20—24	5.4	1.9	5.8	18.6	3.2	na
25—29	2.6	1.2	2.4	14.5	1.6	na
30—34			1.6	13.3	0.7	na
35—39	1.9	1.2	1.2	10.7	0.7	na
40—44			1.0	13.2	0.9	na
45—49	1.9	1.2	1.1	11.7	0.9	na
50—54			1.2	17.6	0.7	na
55—59	2.1	1.1	1.4	13.3	1.2	na
60—64			1.2	20.2	1.0	na
65—69	2.1	1.6	1.2	17.8	1.0*	na
70—74			1.2	23.1		
75+			1.6	37.3		

na=not available.

Sources : *Home Affairs Division (n.d., Vol. 4, p. 256; Vol. 5, p. 40-41).

†Author's tabulation from HED Survey data tape.

‡Statistics Division (n.d., p. 51).

§Non-agricultural labor force only. Rates by age not available for total CLF.

Table 3: Unemployment rate by sex, marital status and education, HED Survey, Pakistan, 1973 (as per cent of the civilian labor force)

	Male				Female			
	Total	Illiterate	<Matric	Matric+	Total	Illiterate	<Matric	Matric+
Pakistan	3.2	2.1	4.4	8.9	14.9	14.7	16.6	15.1
S	6.9	4.4	8.7	20.7	9.8	7.2	12.9	13.0
M	1.3	0.9	1.8	3.0	16.1	16.0	22.2	10.2
W	1.9	1.7	2.6	2.4	17.4	18.5	8.0	12.0
D	2.1	2.5	2.2	1.7	40.7	51.5	15.0	30.4
Rural	2.2	1.4	3.4	10.1	12.8	12.8	9.6	18.6
S	4.8	3.0	6.4	22.7	7.1	5.9	9.1	22.1
M	0.9	0.6	1.4	3.5	13.6	13.7	11.8	11.9
W	1.4	1.3	1.6	1.9	19.1	20.2	3.1	16.7
D	1.7	2.2	1.4	1.4	40.8	49.7	7.0	35.6
Urban	6.1	5.1	6.4	8.0	22.0	24.9	24.5	13.9
S	13.7	11.5	13.3	19.1	16.4	15.4	17.3	16.7
M	2.4	2.2	2.6	2.7	27.5	31.3	33.8	9.6
W	3.7	3.7	4.2	3.4	14.5	15.0	13.1	9.9
D	3.4	4.0	3.9	2.9	49.4	56.7	23.2	25.1

Source : Based on author's tabulation from the HED Survey tape.

S = single

M = married

W = widowed

D = divorced

Table 4 : Per cent of employed persons who were unpaid family helpers by sex and rural-urban residence, various years

1	Total Pakistan 2	Rural 3	Urban 4
1961 Census*			
Total	18.7	27.2§	6.4**
Males	14.8	25.4§	5.5**
Females	59·5	76·2§	19·5**
1973 HED Survey†			
Total	24.1	28.5	10.3
Males	22.5	26.5	10.1
Females	55.0	65.6	14.3
Females in agriculture	..	76.3	..
1974-75 LFS‡			
Total	27.8	34.1	9.9
In agriculture	40.8	41.3	23.7

Sources: *Home Affairs Division (n.d., Vol. 3, V-134-35, Vols 246-47.)
†Population Census Organization (n.d. Table 17).
‡Statistics Division (n.d., p. 81).
§Represents agricultural labor force only.
**Represents non-agricultural labor force only.

Table 5: Mean hours of work by age, sex and marital status, HED Survey, Pakistan, 1973

	Male			Female		
	Total	Rural	Urban	Total	Rural	Urban
Age <25 years	46.1	45.7	47.5	34.8	34.5	36.3
S	45.5	45.1	47.3	35.2	34.9	36.3
M	49.7	50.0	48.8	34.1	33.7	37.1
W	43.2	44.6	38.0	31.0	32.2	28.6
D	37.5	37.8	36.2	29.5	32.2	18.9
Age 25—44 years	51.0	51.6	49.3	36.2	35.4	38 .9
S	49.9	50.5	48.5	35.9	35.0	36.8
M	51.3	52.0	49.6	36.0	35.3	39.3
W	48.9	49.3	47.4	39.6	38.7	41.1
D	42.3	42.8	40.3	30.8	28.2	35.5
Age 45—99 years	49.1	49.4	48.2	35.1	34.4	37.6
S	46.0	46.4	44.9	26.2	25.2	28.6
M	49.7	50.0	48.9	35.5	35.0	37.9
W	46.1	46.4	45.3	37.7	36.2	40.2
D	36.0	36.6	34.1	23.1	22.4	24.5
All Ages	49.0	49 .1	48.5	35.5	34.9	37.8
S	46.4	46.1	47.5	34.7	34.3	35.9
M	50.6	51.0	49.3	35.5	35.0	38.6
W	46.8	47.1	45.7	38.2	36.9	40.3
D	38.5	39.1	36.3	27·5	26.7	29.1
All Ages, both sexes* LFS 1974-75	49.9	49.9	50.0			

Source: *Robinson and Abbasi (1979:320).
Note: Unless otherwise specified, the data in this and subsequent tables are based on author's tabulations from the HED Survey data tape.

Table 6 : Mean Hours of work by age, sex and education, HED Survey, Pakistan, 1973

	Male			Female		
	Total	Rural	Urban	Total	Rural	Urban
Age <25 years	46.1	45.7	47.5	34.8	34.5	36.3
Illiterate	46.2	45.8	48.2	35.4	35.0	38.6
<Matric	46.1	45.7	47.2	27.2	26.0	28.7
Matric+	45.1	44.3	45.8	36.8	34.8	37.6
Age 25—44 years	51.0	51.6	49.3	36.2	35.4	38.9
Illiterate	52.2	52.5	50.8	37.1	36.4	41.5
<Matric	49.9	50.1	49.5	23.9	19.6	29.9
Matric+	45.8	44.6	46.5	37.3	30.3	38.8
Age 45—99 years	49.1	49.4	48.2	35.1	34.4	37.6
Illiterate	50.0	50.1	49.5	37.1	36.1	40.9
<Matric	48.0	47.9	48.1	16.4	12.4	21.7
Matric+	41.5	38.3	44.1	32.3	26.7	37.1
All Ages	49.0	49.1	48.5	35.5	34.9	37.8
Illiterate	49.7	49.7	49.7	36.5	35.9	40.6
<Matric	48.1	48.0	48.5	23.1	20.0	27.3
Matric+	44.6	43.0	45.8	36.5	31.4	38.2

Table 7: Mean hours of work for males and females in various occupations, HED Survey, Pakistan, 1973

Occupation	Male		Female	
	$\bar{x}$	Standard Deviation	$\bar{x}$	Standard Deviation
1	2	3	4	5
Total	49.0	14.6	35.5	16.9
Professional, technical and related	37.4	16.1	35.0	16.1
Medical doctors, assistants	45.9	16.0	45.3	14.4
Nurses	47.4	15.3	45.8	12.1
Primary school teachers	39.9	12.5	37.6	12.5
Scientists, architects	43.5	14.8	23.0	19.3
Administrative, managerial	42.3	17.9	26.0	22.2
Clerical, related	46.8	11.3	36.7	17.6
Sales workers	50.8	14.0	39.4	18.4
Service workers	48.5	14.9	42.3	16.1
Maids, housekeepers	51.9	15.6	44.2	15.8
Agricultural workers	50.3	14.8	36.2	14.9
General farmers	50.2	14.7	36.5	15.3
Farm workers	50.9	14.6	35.8	13.6
Production workers	48.1	13.4	27.5	22.3
Tailors, dressmakers	49.6	13.0	34.6	14.4
General construction labourers	48.9	11.9	42.4	14.1

Table 8 : Mismatch of education and occupation for those who worked 40+ hours during the current week by broad occupation groups HED Survey, Pakistan, 1973

Occupations	Percentages					
	Male			Female		
	Total	Rural	Urban	Total	Rural	Urban
Professional technical	62.7	61.1	57.0	54.8	60.3	61.9
Administrative and managerial	55.0	42.8	63.3	47.0	10.6*	69.7*
Clerical and related	65.7	65.3	71.0	60.8	35.3	62.7
Sales	44.0	38.8	47.1	25.1	15.7	31.3
Service	29.0	25.0	31.0	3.0	1.6	3.6
Agriculture	14.8	14.6	22.6	2.6	2.4	8.1
Production workers	28.1	21.4	35.4	16.0	8.5	23.9
Total	24.6	18.9	41.8	11.5	5.7	30.3

*N less than 1,000 weighted cases.

Table 9: Utilization of labour force by sex and urban-rural residence, HED Survey, Pakistan, 1973

	Civilian Labour Force	Inadequately Utilized by: Unemployment	Inadequately Utilized by: Time (< 40 hours)	Inadequately Utilized by: Mismatch	Adequately Utilized
PAKISTAN					
Both sexes	17,865,526				
%	(100)	3.8	18.8	18.8	58.6
Males	16,881,545				
%	(100)	3.2	17.2	18.3	61.3
Females	983,981				
%	(100)	14.9	46.1	4.4	34.6
RURAL					
Both sexes	13,394,061				
%	(100)	2.8	20.3	14.2	62.7
Males	12,633,432				
%	100	2.2	18.5	15.0	64.3
Females	760,629				
%	(100)	12.8	49.9	2.1	35.2
URBAN					
Both sexes	4,471,465				
%	(100)	6.9	14.4	30.6	48.1
Males	4,248,113				
%	(100)	6.1	13.5	33.3	47.2
Females	223,352				
%	(100)	22.0	33.1	13.4	31.5

References

Anwar, Abdul Aziz 1973—*Problems of Unemployment of the Educated Manpower*. Lahore : The Board of Economics Enquiry, Punjab.

Clogg, Clifford C. 1979—*Measuring Underemployment: Demographic Indicators for the United States*. New York: Academic Press.

Farooq, Ghazi M. 1975—*Dimensions and Structure of Labour Force in Relation to Economic Development: A Comparative Study of Pakistan and Bangladesh*. Islamabad : Pakistan Institute of Development Economics.

Hauser, Philip M. 1977—The measurement of labour utilization : more empirical results. *Malayan Economic Review* 22(1).

1974—The measurement of labour utilization. *Malayan Economic Review* 19(1).

Home Affairs Division n.d.—*Census of Pakistan*, 1961. Vol. 3, 4 and 5, Karachi : Manager of Publications.

Irfan, Mohammad 1981—Pakistan's labor force, its size and structure: a review of evidence. Islamabad: Pakistan Institute of Development Economics, Research Report Series, No. 116.

Khan, Seemin A. and Faiz Bilquees 1977—The environment, attitudes and activities of rural women: a case study of a village in Punjab. *The Pakistan Development Review* 15(3).

Naseem, S.M. 1973—Mass poverty in Pakistan : some preliminary findings. *The Pakistan Development Review* 12 (4).

Nawaz, Mohammad 1973—*Unemployment in Pakistan*. Lahore : Progressive Publishers (Progressive Paper Series, No. 10).

Population Census Organization n.d.—*Housing, Economic and Demographic Survey*, 1973. Vol. II, part I, Islamabad.

Rado, E.R. 1976—Unemployment among the educated in Pakistan, Geneva International Labour Organization, United Nations Development Program (mimeographed).

Robinson, Warren C. and Nasreen Abbasi 1979—Underemployment in Pakistan. *The Pakistan Development Review* 18 (4).

Saeed, Kishwar 1966—*Rural women's participation in farm operations.* Lyallpur : West Pakistan Agricultural University Press.

Shah, Makhdoom A. and Zeba Sathar 1978—Quantification of unemployment and underemployment in Pakistan—problems of conceptualization and measurement. In Papers, *Proceedings and Recommendations of the National Conference on Employment Planning and Basic Needs in Pakistan*, Islamabad, May 15-18, 1978, organized by ILO and Pakistan Manpower Institute.

Shah, Nasra M. and Makhdoom A. 1980—Trends and structure of female labor force participation in rural and urban Pakistan. In Alfred de Souza (ed.) *Women in Contemporary India and South Asia*, New Delhi : Indian Statistical Institute.

Shah, Nasra M., Makhdoom A. Shah and Tauseef Ahmed 1977—Labor force, employment and unemployment statistics in Pakistan. In Pakistan Manpower Institute (ed). *Manpower and Employment Statistics in Pakistan*, Proceedings of a national seminar, Islamabad.

Shah, Nasra M. and Peter C. Smith 1981—Issues in the labor force participation of migrant women in five Asian countries. East-West Population Institute Working Paper No. 19, Honolulu, Hawaii.

Smith, Peter C. and Lita J. Domingo 1977—The social structure of the underutilized labor in the Philippines : an application of Hauser's labor utilization framework. *The Philippine Review of Business and Economics* 14(2).

Statistics Division n.d.—*Labour Force Survey* 1974-75. Karachi : Ministry of Finance, Planning and Economic Affairs, Government of Pakistan.

Sullivan, Teresa A. 1978—*Marginal Workers, Marginal Jobs : Underutilization in the U.S. Workforce.* Austin : University of Texas Press.

CHANGES IN THE INDIAN WORK FORCE IN THE RECENT PERIOD*

J. KRISHNAMURTY

The release of some results of the 1981 Census has led to considerable speculation about what has been happening to the Indian work force over the last decade. This paper presents in comparable form the data available from the Censuses and the National Sample Survey relating to this period. Basically two questions are of interest to the planner. First, given high and constant population growth for more than a decade, have participation rates changed? Secondly, can one discern trends in the structure of the work force—in particular, has there been any evidence of a relative shift away from agriculture? Apart from the all-India picture, it is also necessary to pose these questions at the State level, for the diversity of Indian states is by now well known.

The 1971 Census adopted the concept of main activity i.e., the activity (not necessarily work) in which the person "engaged himself mostly". This was a big shift from the 1961 Census where a person was deemed a worker if he had worked for the major part of the working season or for the last fortnight preceding the date of enumeration. The effect of the 1971 definition was that many people who did work of an intermittent nature are likely to have reported non-work as their main activity; one would assume that if the 1961 definitions were applied, most of these people would have been deemed workers. Not surprisingly the 1971 Census recorded a crude worker participation rate (CWR) of 32.9 per cent compared to the 1961 rate of about 43 per cent. To some extent this reflected changes in the age-sex-residence structure of the population, but if this had been the only factor the 1971 CWR would have been 42.2 per cent not 32.9 per cent. A subsequent resurvey by the Census authorities suggested a CWR for 1971 of 34.9; this too would represent some fall in the CWR between 1961 and 1971 reflecting the differences in the concepts used in the two censuses.

Two alternative interpretations of the 1971 results are possible. One could argue that, given the concept of main activity, the Census estimated the relevant participation rates reasonably well on the basis of the concepts and procedures laid down for this purpose. However, this main activity rate cannot be compared with any other rate obtained earlier. Alternatively, one might argue that even in terms of the new concept, the CWRs were under-estimated. In support one might point out that the post-1971 resurvey, which canvassed the 1971 Census schedule to a sample, obtained a higher estimate. But this could reflect the fact that the Census resurvey was conducted in December 1971—April 1972 instead of being centred at April 1, 1972 when conditions present in April 1, 1971 (when the 1971 Census was conducted) might have been simulated. The resurvey took a more busy period and this might explain the higher CWR recorded.[1]

In the meanwhile, following upon the recommendations of the Dantwala Committee, the National sample Survey (NSS) undertook a detailed survey of employment and unemployment in its 27th Round (October 1972—September 1973. One of the concepts it employed was that of the usual status labour force. Under this, a person was classified as a worker if he had followed this activity (i.e., work) for a long period in the past and expected it to continue in the future.[2] This again did not impose any minimum period of work to qualify as a worker; it merely attempted to record the enduring aspect of a person's activity pattern. The NSS 27th Round reported worker participation rates by age, sex and residence, and these, when applied to the 1971 population give a CWR of 41.4 per cent—very near the estimate for 1971 based on 1961 participation rates applied to the 1971 population, but well above the 1971 actuals or even the post—1971 resurvey.

In 1977-78 the National Sample Survey conducted a fresh round (32nd Round) on employment and unemployment and defined usual status afresh. The reference period was now the 365 days preceding the date of enumeration and the usual status of an individual had to be chosen from one of three activities (employment, unemployment, outside the labour force) on the basis of major time. This produced a new set of estimates which again could not be directly compared with other estimates. However, the NSS did record the secondary activity of all those whose principal activity was non-work and by reclassification, marginal workers (i.e., those whose principal activity was non-work, but secondary activity was work) could be included to produce a new estimate much closer to the 1972-73 estimate. The idea here was that anybody who did work "on a regular basis in a subsidiary capacity" during the last year would be included as a worker, as was presumably the case in 1972-73. The revised 1977-78 CWRs correspond rather well with the 1972-73 estimates.

---

*This paper reports results based on the available data of the Census and the National Sample Survey. Much of the work reported here was done jointly with my colleague Dr. K. Sundaram. Responsibility for any errors that remain is mine.

[1]See *Census of India*, 1971, Series I—India, Miscellaneous Studies, Paper 1 of 1974. Report on Resurvey on Economic Questions: Some Results, New Delhi, 1974.

[2]The usual status was defined by the NSS as "the status which prevailed over long period in the past and which is also likely to continue in future..." See NSS, 27th Round, Draft Report 255/10, p. 8.

For the 1981 Census, it was decided to adopt the same reference period as in the 32nd Round of the NSS, but it was probably felt that in a Census operation there was the great danger that the enumerator or respondent, to avoid further questions, might report non-work as the main activity. Hence the first question (Q. 14A) asks: "Worked any time at all last year?" The aim was to net in, in the first instance, as large as possible a work force to whom further questions could be addressed. In the very next question, the respondent is asked (Q. 14B): "If yes in 14A, did you work for the major part of the last year". Further questions follow, which need not detain us here.

The important point to note is that we have in theory a large set of persons who worked even nominally last year, and within it, a sub-set who chose between work and non-work and decided that work was their main activity. Putting it another way, one group of persons felt that the majority of last year was spent at work (main activity workers), while another felt that they did work, but that the majority of their last year was spent at non-work (marginal workers).

One cannot treat the main plus marginal workers of the 1981 Census as equivalent conceptually to the usual status main activity workers plus the usual status secondary activity workers of the 32nd round. One may recall that the NSS asked the individual to choose between three activities in determining the dominant activity of the previous year; but the 1981 Census asks the individual to choose between only two activities (work and non-work). This means if over 365 days a person worked 121 days or less, he is a non-worker in both the Census and the NSS; again, if he worked 183 days or more he is a worker according to both. But if he worked 122-182 days, he would be a non-worker according to the Census, but according to the NSS he would be a worker or a non-worker, depending on how his days of non-work are divided between unemployment and being outside the labour force. If either yields a larger number of days than the days at work, he is a non-worker. Further, the 1981 Census has no specified lower limit on the quantum of work that qualifies a person to call himself a marginal worker. Working "anytime" last year is enough. The NSS, however, requires some degree of regularity in the pursuit of secondary work and hence (in theory) ought to catch a smaller segment.

Assuming for the moment that the concepts and definitions were adhered to in the field, the NSS main activity worker estimate should be larger than that of the 1981 Census; at the same time the marginal worker estimate of the NSS ought to be smaller than that of the Census since it is defined more restrictively. In order to check whether this is indeed the case we need to estimate the NSS all-India rates using population weights for rural and urban areas of individual States/Union Territories, based on interpolating for 1977-78 from the census estimates of population for 1971 and 1981. We also must assume that no large change in the age structure or specific participation rates occurred between 1977-78 and 1981.

The results at the all-India level (See Table 1) show that when we club main and marginal workers, the worker rates for males are very close, but for females the worker rates from the Census are markedly lower than those of the NSS. The rates for rural males were around 54 to 55 per cent for urban males around 50 per cent; but for rural females the NSS 32nd Round reported a rate of 34 per cent and the 1981 Census one of about 23 per cent. For urban females too the NSS rate is markedly higher: 16 per cent compared to the Census estimate of 8 per cent.

The same table also demonstrates the much better match between the results of the 27th and 32nd Round of the NSS: when marginal workers are included in the 32nd Round estimate, it comes close in coverage to the wider definition of usual status work employed in the 27th Round. For rural females—usually the problem segment—the rates of the two Rounds are indeed very close, though for urban females—a rather small segment—they are not far apart, but not very close. The NSS results also suggest that the segment-specific rates are rising slowly.

The 1971 and 1981 rates on the basis of main activity match fairly well at the all-India level, being 33.06 and 33.45 per cent respectively for all persons. It should be noticed however that the rates for rural females in 1981 are markedly higher than in 1971. In the case of all-India, the 1981 rate was 16 per cent compared to 13.4 per cent in 1971. Also, while crude rates may match reasonably for males, age-residence specific rates (as we point out later) do not match.

When we consider changes in worker rates by State, sex and residence neither the close match between the two NSS surveys (using usual status and including marginal workers in the 32nd Round) nor the close match between the 1971 and 1981 Censuses on the basis of main activity survives. Predictably, the rates for males are generally reasonably close in each set of comparisons, while the corresponding rates for females do not match well (See Tables 2A & B).

For our analysis we need comparable worker estimates for the beginning and the end of the 1970's which are reasonably disaggregated by state, rural-urban residence, sex and branch of economic activity. Unfortunately, in practice some compromise on quality has to be made: the NSS provides fairly comparable data, but disaggregation by branch of activity and State and residence is not available for 1972-73, and the details on branch of activity of marginal workers in 1977-78 even for all-India is very limited. On the other hand, the Census data by main activity is available for 1971 and 1981, by State, sex and residence. But even for males comparability is poor: the declines in 1981 in age-specific participation rates in the age groups 25-29, 30-39, 40-49 and 50-59 are suspect (Table 3). The rural male standardised work participation rate (using at both points the 1971 age structure) declines sharply from 53.6 per cent in 1971 to 51.4 per cent in 1981. The all areas male standardised work participation rate (using at both points the 1971 age-residence structure) also declines sharply from 52.6 to 50.6 per cent. In the face of these declines, the decline in agriculture's share between 1971

and 1981, which we note later in this paper, could be overstated. For individual States, age-specific rates are not available for 1981 and judgement on the comparability of 1971 and 1981 worker estimates has to be postponed.

The Movement Away from Agriculture

The share of agriculture (cultivators plus agricultural labourers) in the Census main activity work force declines over the 1971-1981 period for India and each of the 16 major States for rural and urban areas taken together (Table 5). Partly this is associated with the rise in the share of the urban sector in the work force, but as we have argued earlier, to some extent it could reflect poorer coverage of males in 1981 resulting in a differential undercount of agricultural workers, which would lower the 1981 agricultural proportion. Also, the proportion of the "unspecified" in 1971 was small and in 1981, the proportion in unknown for they have been put under "other services". But an examination of the changes in the proportion in "other services" in 1971 and 1981 does not suggest that the unspecified have swelled substantially in 1981. Since the declines generally are of 2 percentage points or more, they may well be genuine even after taking account of the problems stated earlier in this paragraph. Also, at the all-India level, the NSS results suggest a decline in the share of agriculture (including allied activities) for both sexes and for rural and for urban areas (Table 6).

Another important finding (Table 7) is that the share of cultivators in the male work force declined in virtually every major state and at the all-India level. Only Uttar Pradesh shows virtual constancy. Again, these declines could be overstated given the decline in the standardised work participation rates discussed earlier.

The share of agricultural labourers in the male work force also declines in most States. The only exceptions are Punjab, where it rises significantly and Jammu and Kashmir, where it rises nominally. The relative declines might be reversed in a few cases when account can be taken of the unspecified, for the declines are mostly within about 3 percentage points.

We next examine the situation for rural areas (Tables 8 and 9). With the exception of Andhra Pradesh and Uttar Pradesh, in the remaining 14 States and in India, the share of agriculture declines. While reported worker rates generally decline, they do rise slightly in Gujarat, Haryana, Maharashtra and West Bengal. But we are unable to determine the relative roles of the age effect or changes in age-specific worker participation rates. Also, as mentioned earlier, the shares of agriculture in all the States in 1981 may turn out slightly higher when account is taken of the unspecified. It is possible that the declines in agriculture's share in rural areas over the decade may not be real in States where the declines are small. But in Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Rajasthan and West Bengal, where the declines (without taking account of the unspecified) are of the order of about 3 percentage points the declines (without taking account of the unspecified) in agriculture for males in rural and urban areas taken together would probably persist even if comparability were ensured: in some States this would reflect structural change within the economy from rural to urban; in others, structural change also *within* rural areas from agriculture to non-agriculture.

The share of cultivators declines only slightly for rural India. It declines for most States, though not for Andhra Pradesh, Bihar, Karnataka, Orissa and Uttar Pradesh.

The share of agricultural labourers also tends to decline in the majority of States, though slight increases are recorded for Gujarat, Haryana, and Jammu and Kashmir. Again, the estimates, if comparability were ensured, might give a somewhat different picture, except in Karnataka, Maharashtra and Uttar Pradesh where the declines exceed 3 percentage points and are unlikely to be cancelled out by the inclusion of the unspecified.

Trends within Non-Agriculture

We discuss shifts in the structure of the non-agricultural work force separately for they are based on estimates which, for 1981, were obtained from a 5% sample.[1] Only for household manufacturing are the estimates based on a full count. Since the size of the work force and the employment in cultivation, agricultural labour and household manufacturing are based on a full count, their adoption as control figures for the sample distribution may have generated distortions and consequent adjustments in the estimates for the remaining six sectors from the sample data.

For all-India, all areas, there is a sharp rise in the share of manufacturing from 10.1 to 12.1%, resulting from a sharp increase in non-household, and some decline in household manufacturing. Construction, trade and commerce, transport, storage and communications and other services display modest increases (Table 10).

Roughly a half of the decline in the share of agriculture is taken up by a rise in the share of manufacturing. In virtually all States the share of manufacturing rises, but it is specially marked in Gujarat Haryana, Punjab and Tamil Nadu. In Kerala, there is a sharp rise in the share of trade and commerce.

In the rural sector, at the all-India level there is a 2 percentage point decline in agriculture (including allied activities) and a 1 percentage point rise in manufacturing. Again household manufacturing declines. Other services also declines, while construction, trade and commerce and transport, storage and

---

[1] These results are in *Census of India*, 1981, Series 1, Paper 2 of 1983, Key Population Statistics Based on 5 per cent Sample Data Delhi, 1983, Tables 16—18.

communications rise. At the State level the share of manufacturing distinctly rises in most States; only in Kerala is there a slight decline.

In urban India again the share of manufacturing rises quite sharply, from 28.6 to 30.3 per cent, while the share of agriculture hardly changes. Apart from household manufacturing, trade and commerce, transport, storage and communications and other services decline. Construction shows some increase. In most of the States the share of manufacturing rises: in Andhra Pradesh, Gujarat, Haryana, Punjab, Rajasthan and Tamil Nadu, the increase is large, and only in Maharashtra is there a token decline. For the individual sectors, we need also to bear in mind changes in the definitions and coverage of urban areas between 1971 and 1981 which could affect comparability.[1]

The NSS results for males (including marginal workers) support the conclusion that the share of manufacturing rose in rural, urban and total India (Table 11). The increases are, however, less sharp than those of the Census. While at the all-areas level, the shares of the individual service sectors rise, in urban areas the shares of construction and other services decline slightly. The all-areas result suggests that while agriculture's share declined by over 3 percentage points, the share of manufacturing rose by about 1.25 percentage points only. The Census main activity results show a slightly sharper fall (4 percentage points) in agriculture (including allied activities) and a sharper rise (2 percentage points) in manufacturing. In other words, the Census results indicate a sharper structural shift, away from agriculture and towards manufacturing, than the NSS.

Trends in Agricultural Labour/Casual Wage Labour in Rural India

A major difference between the Census and the NSS results relates to casual wage labour especially agricultural labour. As we have already seen Census data suggests declining proportions of agricultural labour in rural India. The NSS evidence on casual labour gives a contrary picture (Table 12). We take the proportion to the work force of (a) casual workers in 1972-73 and (b) casual workers in agriculture in 1977-78. The latter proportion is higher than the former for both rural males and rural females for India and for rural males in 6 of the 12 States for which information is available. But in 3 more States the proportions for rural males are very close, so that even if 1% of the work force in 1972-73 were casual workers in non-agriculture, the share of casual workers in agriculture must have risen between 1972-73 and 1977-78. For rural females, in 7 States the share must have risen sharply and in 2 more, slightly.

The conclusion that the share of casual agricultural workers (who account for the overwhelming proportion of agricultural labourers) rose over the 1970s appears more plausible than the contrary result of the Census. Apart from the fact that the NSS data are of better quality, demographic and economic factors including reduced access to land are likely to have led to a rising proportion of casual workers dependent on wage employment often of an intermittent kind.

Conclusion

A shift away from agriculture appears to have occurred in most parts of India over the last decade. This result, supported by NSS and Census data runs counter to the conventional wisdom which asserts the changelessness of the structure of employment in the past and the unlikelihood of a change in the near future. The extent to which this process of shift has been related to a rising share of manufacturing reflecting positive growth forces in the economy is difficult to determine. The Census suggests that manufacturing employment has increased its share rapidly, while the NSS suggests that much more of the decline in agriculture's share has been made up by the services sectors, which might be indicative of a less positive growth scene over the decade. Again if the Indian rural work force is becoming progressively casualized (and the NSS results suggest a similar process is on in urban India), the declining share of agriculture could reffect, at least in part, the growing inability of agriculture to take on the increased numbers added to the work force. This in turn could be due to not only demographic pressures but adverse trends in the agrarian sector. As the land base of agriculturists becomes progressively smaller, especially for those for whom it is already small, more and more workers would have to look for casual, intermittent employment in rural and urban areas. This cannot be looked upon as a happy situation. On the other hand, to the extent that there has been a modest rise in per capita income over the last twenty to thirty years some shift in the employment structure away from agriculture should have been taking place. Perhaps it was only in the last decade that this underlying trend became clear; it might have been happening over a longer period but was obscured by our proverbial inability to produce comparable serial statistics on the employment structure.

---

[1] A number of changes in the effective definition of urban areas occur between one Census and another, and these affect comparability. In particular statutory towns are classified as urban depending on administrative decisions, not economic or demographic principles. Also for other urban areas, in 1971 and 1981 a requirement was that 75% of the male work force should be in non-agriculture. But non-agriculture included activities allied to agriculture in 1971 and excluded such activities in 1981, thereby creating further problems of comparability of 1971 and 1981.

Table 1 : Crude Worker Participation Rates, All-India, 1971 to 1981

	Rural Male %	Rural Female %	Urban Male %	Urban Female %
Main Activity				
1971 Census	53.62	13.36	48.80	6.65
1981 Census	52.62	16.00	48.54	7.28
1977-78 NSS	53.65	24.69	49.43	12.22
Modified Main Activity (including Marginal Workers)				
1972-73 NSS	54.59	31.91	50.12	13.41
1977-78 NSS	55.21	32.97	50.66	15.65
1981 Census	53.80	23.18	49.07	8.32

Source : *Census of India*, 1981, Series 1, India, Primary Census Abstract, Delhi 1983.

National Sample Survey, Draft Reports 255/10; 298

Notes : (i) The NSS estimates were pooled for the States and Union Territories by sex and residence using interpolated population for 1977-78 in the light of the 1981 Census. The estimates include Assam.

(ii) Throughout this paper, all-India estimates of the Census exclude Assam.

Table 2A: Crude Worker Rates during the Seventies at the State Level (Extended concept of Work)
(Percentage to Total Population)

State	Rural				Urban			
	Males		Females		Males		Females	
	1972-73	1977-78	1972-73	1977-78	1972-73	1977-78	1972-73	1977-73
1. Andhra Pradesh	61.24	61.17	44.27	44.57	49.80	51.61	18.33	21.25
2. Assam	49.91	51.24	7.60	11.53	49.08	48.57	2.87	5.45
3. Bihar	52.32	52.07	19.82	20.89	49.74	47.58	9.82	9.07
4. Gujarat	51.67	55.06	37.37	39.30	49.14	49.39	12.63	13.19
5. Haryana	48.88	50.52	28.79	26.61	45.05	47.84	9.25	12.34
6. Himachal Pradesh	51.98	58.78	44.90	57.44	58.08	56.61	10.91	15.58
7. Jammu & Kashmir	54.38	55.56	22.58	41.95	47.12	49.61	6.89	12.7
8. Karnataka	57.07	58.48	42.58	37.33	49.19	49.16	22.26	18.26
9. Kerala	46.82	50.76	25.38	41.26	44.21	49.05	18.45	28.64
10. Madhya Prádesh	56.47	57.20	44.18	42.23	46.35	47.66	14.84	14.01
11. Maharashtra	54.21	56.78	45.10	47.47	51.19	51.16	14.71	15.72
12. Orissa	56.33	56.46	29.99	27.43	52.33	53.49	15.53	14.92
13. Punjab	54.38	55.90	26.80	27.60	53.16	54.15	11.18	13.92
14. Rajasthan	58.23	57.71	53.15	53.04	47.11	45.42	20.10	19.76
15. Tamil Nadu	59.99	60.29	44.16	44.43	51.72	53.67	16.84	24.15
16. Uttar Pradesh	52.70	52.15	23.55	21.29	50.44	49.92	8.04	9.33
17. West Bengál	51.49	53.78	13.19	17.61	54.97	54.53	8.58	10.11
ALL INDIA	**54.59**	**55.21**	**31.91**	**32.97**	**50.12**	**50.55**	**13.41**	**15.59**

Source : Data for this table have been computed from NSS reports for the 27th Round (1972-73) and Report 298 (Revised) for the 32nd Round (1977-78).

Table 2B : Crude Worker Rates (%) by Main Activity, 1971 and 1981 by Sex, State and Residence

State	Rural Males		Rural Females		Urban Males		Urban Females	
	1971	1981	1971	1981	1971	1981	1971	1981
1. Andhra Pradesh	60.2	59.6	27.4	31.9	49.9	49.3	10.5	10.5
2. Bihar	52.7	50.0	9.3	9.7	47.5	43.8	4.5	4.2
3. Gujarat	52.8	53.3	12.1	13.5	47.3	49.9	5.5	5.5
4. Haryana	47.5	48.6	2.3	4.9	46.2	50.0	3.0	4.0
5. Himachal Pradesh	52.3	49.2	21.7	19.4	54.5	53.5	7.1	9.6
6. Jammu & Kashmir	53.7	52.9	4.2	6.1	47.1	49.7	2.5	5.1
7. Karnataka	56.4	56.4	15.8	22.3	48.3	47.9	9.2	10.5
8. Kerala	45.3	41.2	14.1	13.5	43.5	40.4	10.4	9.7
9. Madhya Pradesh	55.3	55.3	20.8	25.8	45.2	45.8	7.3	8.3
10. Maharashtra	52.6	53.9	24.4	31.4	51.1	50.2	8.3	9.1
11. Orissa	55.8	55.1	6.8	11.1	50.6	49.4	6.6	7.7
12. Punjab	53.8	53.7	0.7	1.7	49.9	51.8	2.7	3.7
13. Rajasthan	53.6	51.0	9.3	10.5	45.1	45.9	3.9	4.5
14. Tamil Nadu	58.6	58.3	17.6	27.9	50.3	50.8	9.1	11.0
15. Uttar Pradesh	53.0	51.0	7.3	5.9	47.9	47.3	3.1	3.0
16. West Bengal	48.9	48.7	4.6	6.2	49.8	48.7	3.9	4.7
ALL-INDIA	**53.6**	**52.6**	**13.4**	**16.0**	**48.8**	**48.5**	**6.7**	**7.3**

Note : All-India excludes Assam in both 1971 and 1981.

Source : *Census of India*, 1981, Series 1, India, Part II-B(i), Primary Census Abstract, Delhi 1983 and *Census of India*, 1971, Series 1, India, Part II-B(i), General Economic Tables, Delhi, 1977.

Table 3 : Age-specific Worker Participation Rates : Census Main Activity, 1971 and 1981

Age group	Rural Males		Rural Females		Urban Males		Urban Females	
	1971	1981	1971	1981	1971	1981	1971	1981
0—14	7.56	6.30	3.05	3.53	2.75	2.45	0.82	0.88
15—19	62.31	58.19	18.80	22.77	28.32	31.54	5.51	6.19
20—24	86.56	82.71	20.58	24.29	67.49	63.35	9.54	9.29
25—29	95.45	92.79	22.16	25.14	90.54	86.78	11.68	12.17
30—39	97.61	96.71	23.78	28.45	95.45	94.93	13.11	15.14
40—49	97.62	97.25	24.43	28.90	95.15	95.49	14.53	15.34
50—59	95.50	94.08	21.08	23.94	87.85	86.86	12.71	12.42
60+	77.52	67.59	11.49	11.29	55.35	47.49	6.46	5.75
All Ages	53.62	52.62	13.36	16.00	48.80	48.54	6.65	7.28

Source : *Census of India, 1981*, Series 1, Paper 2 of 1983, Key Population Statistics Based on 5% Sample Data, Delhi, 1983, Table 15

Table 4 : Age-specific Worker Participation Rates : NSS Data (inclusive of Marginal Workers) 1972-73 and 1977-78

Age group	Rural Males		Rural Females		Urban Males		Urban Females	
	1972-73	1977-78	1972-73	1977-78	1972-73	1977-78	1972-73	1977-78
5—14	13.92	14.42	10.70	11.64	5.59	6.09	3.07	4.43
15—29	84.49	85.29	49.26	49.65	64.56	65.75	16.81	19.70
30—44	98.64	98.90	60.94	61.19	97.36	98.01	27.61	30.29
45—59	96.09	96.27	51.97	53.37	92.39	93.25	26.28	25.28
60+	69.81	66.71	21.85	21.98	53.17	51.16	12.36	12.86
5 and over	63.84	64.06	37.53	38.48	57.09	57.48	15.33	17.80

Source : 1972-73 : Seal in ARTEP, Women in the Indian Labor Force, Bangkok, 1981, Table 3.3.
1977-78 : NSS, Draft 298, Table 29.

Table 5 : Crude Worker Rates by Main Activity and Share of Agriculture 1971 and 1981 Censuses Males (Rural plus Urban)

State	Crude Worker Rate		Share of Agriculture	
	1971	1981	1971	1981
1. Andhra Pradesh	58.22	57.12	65.08	63.37
2. Bihar	52.16	49.19	80.85	77.36
3. Gujarat	51.24	52.19	62.51	56.83
4. Haryana	47.27	48.94	65.40	59.82
5. Himachal Pradesh	52.43	49.59	67.83	63.29
6. Jammu and Kashmir	52.50	52.20	67.60	59.80
7. Karnataka	54.40	53.90	65.28	61.84
8. Kerala	45.00	41.04	46.91	38.89
9. Madhya Pradesh	53.74	53.52	76.03	71.62
10. Maharashtra	52.09	52.51	57.68	52.20
11. Orissa	55.32	54.38	78.04	73.92
12. Punjab	52.82	53.14	63.56	59.04
13. Rajasthan	52.09	49.92	72.70	66.59
14. Tamil Nadu	56.02	55.85	58.66	54.99
15. Uttar Pradesh	52.24	50.31	76.28	73.69
16. West Bengal	48.83	48.71	58.58	55.09
ALL INDIA	**52.61**	**51.62**	**67.23**	**63.26**

Table 6 : Share of Agriculture and Allied Activities in the Work Force 1972-73 and 1977-78 (%)

No.	Segment	1972-73	1977-78
1	2	3	4
1.	Rural Males	83.23	80.55
2.	Rural Females	89.97	88.07
3.	Rural Persons	85.53	83.30
4.	Urban Males	10.71	10.62
5.	Urban Females	32.75	31.94
6.	Urban Persons	14.82	15.26
7.	Total Males	68.91	67.14
8.	Total Females	84.42	82.29
9.	Total Persons	74.02	72.31

Sources : 1972-73 from K.C. Seal in ARTEP, *Women in the Indian Labour Force*, 1981.

1977-78 from NSS Report 298 adjusted for marginal workers.

Table 7 : Share of Cultivators, Agricultural Labourers and Household Industry in Work Force by Main Activity, 1971 and 1981, Males, All Areas

State	Cultivators		Agricultural Labourers		Household Industry	
	1971	1981	1971	1981	1971	1981
1	2	3	4	5	6	7
Andhra Pradesh	37.35	36.86	27.73	26.51	5.10	4.50
Bihar	47.56	46.71	33.29	30.65	2.48	2.32
Gujarat	44.87	38.94	17.64	17.59	2.96	2.43
Haryana	49.62	44.29	15.78	15.62	3.23	2.84
Himachal Pradesh	63.63	60.19	4.20	3.10	3.22	2.24
Jammu & Kashmir	64.51	56.18	3.12	3.63	3.84	4.76
Karnataka	44.16	42.38	21.12	19.01	3.78	3.28
Kerala	21.81	15.67	25.10	23.32	3.11	2.42
Madhya Pradesh	56.70	53.81	19.33	17.81	3.64	3.36
Maharashtra	36.17	33.69	21.51	18.51	3.12	2.61
Orissa	52.17	51.27	25.33	22.65	3.09	2.84

Table 7 — *Contd.*

1	2	3	4	5	6	7
Punjab	43.27	36.99	20.29	22.05	3.10	2.49
Rajasthan	65.07	60.70	7.63	5.89	3.50	3.33
Tamil Nadu	34.51	31.75	25.15	23.24	4.17	4.10
Uttar Pradesh	59.10	59.53	17.18	14.16	3.64	3.56
West Bengal	33.58	31.40	25.00	23.69	2.53	3.09
ALL-INDIA	45.73	43.70	21.71	19.56	3.43	3.18

Table 8 : Crude Worker Rates and Share of Agriculture in the Work Force in 1971 and 1981

(Rural Males — Percentages)

State	CWR		Share of Agriculture	
	1971	1981	1971	1981
1	2	3	4	5
Andhra Pradesh	60.24	59.56	75.60	76.54
Bihar	52.73	50.01	87.70	85.61
Gujarat	52.83	53.27	81.81	77.87
Haryana	47.50	48.63	76.98	74.63
Himachal Pradesh	52.26	49.25	73.38	69.85
Jammu & Kashmir	53.74	52.85	79.46	72.36
Karnataka	56.43	56.41	79.50	74.94
Kerala	45.29	41.19	53.36	45.70
Madhya Pradesh	55.28	55.29	87.17	85.06
Maharashtra	52.60	53.86	81.82	77.08
Orissa	55.79	55.10	83.82	81.61
Punjab	53.75	53.66	78.98	76.92
Rajasthan	53.63	51.02	83.72	80.09
Tamil Nadu	58.55	58.36	76.55	74.77
Uttar Pradesh	52.98	50.98	86.48	87.36
West Bengal	48.48	48.72	78.83	74.66
ALL-INDIA	53.62	52.62	81.36	79.16

Table 9 : Share of Cultivators and Agricultural Labourers in the Work Force 1971 and 1981

(Rural Males —Percentages)

State	Cultivators		Agricultural Labourers	
	1971	1981	1971	1981
1	2	3	4	5
Andhra Pradesh	43.70	45.08	31.90	31.46
Bihar	51.81	51.92	35.89	33.68
Gujarat	59.04	54.15	22.77	23.72
Haryana	58.63	55.48	18.35	19.14
Himachal Pradesh	68.90	65.68	4.48	3.27
Jammu & Kashmir	76.12	68.41	3.34	3.95
Karnataka	54.27	55.32	25.23	19.62
Kerala	25.05	18.62	28.31	27.08
Madhya Pradesh	65.22	61.23	21.95	20.82
Maharashtra	51.85	50.36	29.97	26.72
Orissa	56.74	56.91	27.08	24.70
Punjab	54.15	48.81	28.97	28.11
Rajasthan	75.20	73.32	8.52	6.77
Tamil Nadu	45.64	43.82	30.91	30.95
Uttar Pradesh	67.28	71.53	19.20	15.83
West Bengal	45.57	42.87	33.26	31.79
ALL-INDIA	55.55	55.16	25.81	24.00

Table 10 : Percentage Distribution of the Working Force by Main Activity, 1971-1981 All-India (Excluding Assam), Males

	ALL-INDIA					
	Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981
1	2	3	4	5	6	7
(i) Cultivators	43.90	43.70	55.73	55.16	5.22	5.19
(ii) Agricultural Labourers	21.54	19.56	25.61	24.00	4.70	4.66

Table 10 –*Contd.*

1	2	3	4	5	6	7
(iii) Plantations, Forestry etc.	2.24	2.34	2.39	2.50	1.64	1.81
(iv) Mining and Quarrying	0.54	0.62	0.43	0.49	1.00	1.04
(va) Household Manufacturing	3.42	3.18	3.19	2.87	4.40	4.21
(vb) Non-household Manufacturing	6.70	8.92	2.49	3.82	24.15	26.05
(vi) Construction	1.36	1.81	0.83	1.12	3.57	4.12
(vii) Trade and Commerce	6.37	7.33	2.75	3.27	21.33	20.96
(viii) Transport, Storage and Communications	2.86	3.32	0.97	1.37	10.64	9.88
(ix) Other Services	9.07	9.21	5.62	5.39	23.31	22.06
Total Workers	100	100	100	100	100	100
i + ii + iii	69.68	65.60	83.73	81.66	11.56	11.66
va + vb	10.12	12.10	5.68	6.69	28.55	30.26

Note : The 1981 figures are based on the 5% sample.
India excludes Assam.

Table 11 : Structure of the Work Force : 1972-73 and 1977-78 (Main Plus Marginal Workers, Males, Percentages to Total)

Sl. No.	Sector	Rural		Urban		Total	
		1972-73	1977-78	1972-73	1977-78	1972-73	1977-78
1.	Agricultural (incl. allied activities)	83.23	80.62	10.71	10.59	68.91	65.55
2.	Mining and Quarrying	0.44	0.50	0.95	0.92	0.44	0.59
3.	Manufacturing	5.73	6.44	26.09	27.71	9.75	11.02
4.	Electricity and Gas etc.	0.10	0.19	0.77	1.04	0.23	0.37
5.	Construction	1.56	1.72	4.26	4.11	2.09	2.23
6.	Trade and Commerce	3.06	4.02	20.12	21.58	6.43	7.80
7.	Transport, Storage and Communications	1.00	1.23	9.04	9.87	2.59	3.09
8.	Other Services	4.78	5.27	26.96	24.19	9.16	9.34

Note : Marginal workers in 1977-78 in non-agriculture have been distributed pro-rata between the non-agricultural categories.
Sources : ARTEP : *Women in the Indian Labour Force*, Bangkok 1981, Paper by K. C. Sen. NSS, 32nd Round, Report 298.

Table 12 : Percentage Share of Casual Labour in the Rural Work Force 1972-73 and 1977-78

State	Rural Males			Rural Females		
	1972-73	(A) 1972-78	1977-78	1972-73	(A) 1977-78	1977-78
Andhra Pradesh	27.42	31.23	33.58	48.98	51.17	52.76
Bihar	24.05	30.05	32.63	36.00	43.90	45.72
Gujarat	25.01	26.13	29.41	26.31	29.71	32.07
Haryana	9.67	10.49	14.94	8.38	16.31	18.71
Kerala	39.13	25.73	37.71	47.65	23.72	32.22
Madhya Pradesh	15.50	20.31	22.17	24.79	29.31	31.11
Maharashtra	31.78	27.19	30.79	44.76	43.92	46.77
Punjab	16.01	15.68	19.04	9.58	7.64	8.55
Rajasthan	5.47	6.94	10.85	4.86	6.63	8.27
Tamil Nadu	31.30	30.90	35.20	45.92	45.69	57.29
Uttar Pradesh	13.83	13.64	16.33	15.32	19.37	20.21
West Bengal	32.09	30.59	34.07	38.89	34.49	33.14
ALL-INDIA	22.03	23.16	26.65	31.44	32.26	35.06

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-81
Males

Category	Andhra Pradesh						Bihar					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	37.35	36.86	43.70	45.08	5.86	4.78	47.56	46.71	51.81	51.92	8.58	7.76
(ii) Agricultural Labourers	27.73	26.51	31.90	31.46	7.07	7.22	33.29	30.65	35.90	33.68	9.39	8.00
(iii) Plantations, Forestry, etc.	4.24	3.09	4.75	3.58	1.77	1.20	1.06	0.85	1.05	0.75	1.22	1.63
(iv) Mining and Quarrying	0.61	0.55	0.44	0.41	1.39	1.14	1.55	1.73	0.77	1.00	8.65	7.19
(va) Household Manufacturing	5.10	4.50	5.18	4.52	4.70	4.43	2.48	2.32	2.23	2.21	4.73	3.16
(vb) Non-household Manufacturing	4.97	6.97	2.49	3.63	17.25	19.97	2.88	4.36	1.40	2.39	16.55	19.17
(vi) Construction	1.88	1.87	1.20	1.11	5.25	4.81	0.61	0.85	0.31	0.47	3.45	3.64
(vii) Trade and Commerce	6.33	7.50	3.50	3.86	22.13	21.68	3.65	4.70	1.95	2.58	19.26	20.56
(viii) Transport, Storage and Communications	2.97	3.74	1.00	1.34	12.69	14.72	1.72	2.05	0.88	1.06	9.39	9.44
(ix) Other Services	8.54	8.41	5.84	5.02	21.94	21.62	5.20	5.77	3.72	3.93	18.85	19.50
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
(i) + (ii) + (iii)	69.32	66.46	80.35	80.12	14.70	13.20	81.91	78.21	88.75	86.35	19.19	17.39
(va) + (vb)	10.07	11.47	7.67	8.15	21.96	24.40	5.36	6.68	3.63	4.60	21.28	22.39

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-1981
Males

Category	Gujarat						Haryana					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	44.86	38.94	59.04	54.15	5.50	3.90	49.61	44.29	58.62	55.48	6.79	6.01
(ii) Agricultural Labourers	17.64	17.59	22.77	23.72	3.42	3.46	15.77	15.61	18.33	19.14	3.62	3.53
(iii) Plantations, Forestry, etc.	2.19	2.26	2.44	2.55	1.49	1.59	1.34	0.92	1.48	0.84	0.68	1.18
(iv) Mining & Quarrying	0.42	0.31	0.35	0.25	0.59	0.43	0.16	0.03	0.19	0.03	..	..
(va) Household Manufacturing	2.95	2.42	3.04	2.43	2.72	2.41	3.23	2.84	3.43	2.60	2.26	3.66
(vb) Non-household Manufacturing	10.42	14.67	3.00	5.90	31.02	34.88	6.73	10.26	3.38	5.62	22.62	26.14
(vi) Construction	1.47	1.58	0.63	0.96	3.74	3.03	1.81	2.40	1.48	1.95	3.39	3.92
(vii) Trade and Commerce	7.95	8.82	3.17	3.52	21.20	21.01	6.96	8.34	2.95	3.78	25.79	23.92

APPENDIX TABLE—*Concld.*

Percentage Distribution of the Working Force by Main Activity, 1971-1981

Male

Category	Gujarat						Haryana					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1981	1981	1971	1981	1971	1981	1971	1981
(viii) Transport Storage & Communi-cations	3.31	4.37	1.27	1.83	8.97	10.23	2.52	3.22	1.14	2.03	9.05	7.32
(ix) Other Services	8.78	9.02	4.29	4.70	21.25	18.95	11.80	12.09	8.90	8.52	25.57	24.18
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(i) + (ii) + (iii)	64.59	58.79	84.66	80.42	10.41	8.81	66.72	60.82	78.43	75.46	11.09	10.72
(va) + (vb)	13·37	17·09	6·04	8·33	33·74	37·29	9·96	13·10	6·81	8·22	24.88	23.80

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-1981

Males

Category	Karnataka						Kerala					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	44.16	42.83	54.27	55.32	8.40	7.54	21.80	15.68	25.04	18.62	4.64	2.73
(ii) Agricultural Labourers	21.12	19.01	25.22	23.62	6.62	6.00	25.10	23.32	28.31	27.08	8.08	6.82
(iii) Plantations, Forestry, etc.	4.03	3.91	4.62	4.66	1.89	1.80	7.47	10.39	7.76	10.98	5.96	7.76
(iv) Mining & Quarrying	0.53	0.55	0.39	0.41	0.95	0.90	0.59	0.93	0.62	1.10	0.25	0.21
(va) Household Manufacturing	3.78	3.28	3.26	2.84	5.56	4.54	3.11	2.41	3.17	2.46	2.78	2.31
(vb) Non-household Manufacturing	6.47	8.78	2.30	3.31	21.20	24.22	11.19	12.25	9.63	10.05	19.47	21.93
(vi) Construction	1.92	2.13	1.26	1.19	4.23	4.80	2.16	3.75	2.05	3.37	2.78	5.35
(vii) Trade and Commerce	6.70	7.62	2.77	3.05	20.59	20.51	11.27	13.69	9.33	11.63	21.59	22.77
(viii) Transport, Storage and Communications	3.04	3.18	0.77	1.08	11.07	9.11	4.78	6.03	3.47	4.63	11.66	12.17
(ix) Other Services	8.26	8.71	5.10	4.51	19.37	20.51	12.53	11.53	10.63	10.10	22.65	17.94
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(i) + (ii) + (iii)	69.31	65.75	84.11	83.60	16.91	15.34	54.37	49.39	61.11	56.68	18.68	17.31
(va) + (vb)	10.25	12.06	5.56	6.15	26.76	28.76	14.30	14.66	12.80	12.51	22.26	24.24

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-1981

Males

Category	Madhya Pradesh						Maharashtra					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	56.70	53.80	65.23	64.23	6.62	7.19	36.17	33.69	51.85	50.36	3.47	2.78
(ii) Agricultural Labourers	19.33	17.81	21.94	20.82	3.94	4.37	21.51	18.51	29.97	26.72	3.86	3.29
(iii) Plantations, Forestry, etc.	2.04	2.20	2.06	2.18	1.97	2.32	1.96	2.64	2.11	3.15	1.63	1.71
(iv) Mining and Quarrying	0.72	1.09	0.41	0.84	2.56	2.21	0.26	0.37	0.24	0.38	0.29	0.35
(va) Household Manufacturing	3.64	3.36	3.24	2.98	6.02	5.06	3.12	2.61	3.23	2.44	2.90	2.93
(vb) Non-household Manufacturing	3.76	5.55	0.94	1.88	20.27	21.98	12.53	14.54	2.82	4.82	32.80	32.56
(vi) Construction	0.92	1.58	0.51	1.03	3.34	4.07	1.79	2.21	1.05	1.52	3.33	3.49
(vii) Trade and Commerce	3.97	5.03	1.53	1.79	18.31	19.47	8.50	9.44	2.48	3.15	21.10	21.11
(viii) Transport, Storage and Communications	1.74	2.24	0.43	0.60	9.48	9.62	3.95	4.44	0.86	1.37	10.39	10.13
(ix) Other Services	7.17	7.32	3.71	3.64	27.49	23.73	10.22	11.55	5.39	6.09	20.26	21.66
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
(i) + (ii) + (iii)	78.07	73.81	89.23	87.23	12.53	13.88	59.64	54.84	83.93	80.23	8.96	7.78
(va) + (vb)	7.40	8.91	4.18	4.86	26.29	27.04	15.65	17.15	6.05	7.25	35.70	35.49

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-81

Males

Category	Orissa						Punjab					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	52.71	51.27	56.73	56.91	8.10	7.51	43.27	36.99	54.14	43.81	5.93	5.34
(ii) Agricultural Labourers	25.33	22.64	27.08	24.70	5.92	6.66	20.29	22.04	24.85	28.11	4.63	5.81
(iii) Plantations, Forestry, etc.	2.18	2.39	2.09	2.28	3.16	3.15	0.96	1.20	1.08	1.04	0.58	1.63
(iv) Mining and Quarrying	0.62	0.84	0.52	0.67	1.78	2.06	0.03	0.04	0.03	0.03	..	0.08
(va) Household Manufacturing	3.09	2.85	3.02	2.79	3.75	3.27	3.10	2.51	3.33	2.17	2.20	3.33
(vb) Non-household Manufacturing	2.32	3.95	1.23	2.20	14.62	17.43	8.10	11.35	3.16	5.15	25.12	27.96

APPENDIX TABLE—*Concld.*

Percentage Distribution of the Working Force by Main Activity, 1971-81

Males

Category	Orissa						Punjab					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(vi) Construction	0.59	0.93	0.39	0.58	2.77	3.63	2.01	2.59	1.55	1.85	3.59	4.57
(vii) Trade and Commerce	3.34	4.32	1.93	2.65	18.97	17.31	8.31	8.95	3.19	3.47	26.04	23.70
(viii) Transport, Storage and Communications	1.54	1.89	0.70	0.92	10.87	9.44	2.84	3.85	1.28	2.40	8.10	7.74
(ix) Other Services	8.27	8.93	6.32	6.29	29.84	29.42	11.10	10.55	7.40	6.97	23.84	19.98
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(i) + (ii) + (iii)	80.22	76.30	85.90	83.89	17.18	17.32	64.52	60.23	80.07	77.96	11.11	12.7
(va) + (vb)	5.41	6.80	4.25	4.99	18.37	20.70	11.20	13.86	6.40	7.32	27.32	31.23

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-81

Males

Category	Rajasthan						Tamil Nadu					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	65.07	60.70	75.20	73.32	10.07	9.52	34.52	31.75	45.64	43.82	5.23	3.9
(ii) Agricultural Labourers	7.63	5.89	8.51	6.77	2.84	2.32	24.15	23.24	30.91	30.94	6.35	5.52
(iii) Plantations, Forestry, etc.	2.45	3.00	2.76	3.39	0.73	1.47	2.55	2.67	2.56	2.57	2.55	2.90
(iv) Mining and Quarrying	0.46	0.83	0.44	0.76	0.55	1.13	0.37	0.24	0.39	0.21	0.31	0.31
(va) Household Manufacturing	3.50	3.33	2.98	2.88	6.32	5.16	4.17	4.10	3.52	3.54	5.85	5.40
(vb) Non-household Manufacturing	3.49	6.31	1.23	2.85	15.75	20.29	9.99	12.52	4.64	6.01	24.09	27.48
(vi) Construction	1.34	1.99	0.76	1.12	4.49	5.56	1.76	2.03	1.09	1.08	3.52	4.20
(vii) Trade and Commerce	5.00	5.98	2.24	2.73	19.96	19.16	9.15	10.81	3.90	4.91	22.97	24.32
(viii) Transport, Storage and Communications	2.25	2.84	0.76	1.17	10.35	9.64	3.81	4.24	1.04	1.63	11.11	10.25
(ix) Other Services	8.84	9.13	5.11	5.02	29.12	25.79	9.53	8.41	6.30	5.28	17.99	15.59
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(i) + (ii) + (iii)	75.15	69.59	86.47	83.48	13.64	13.31	61.22	57.65	79.11	77.33	14.13	12.40
(va) + (vb)	6.99	9.64	4.21	5.73	22.07	25.75	14.16	16.62	8.16	9.55	29.94	32.88

APPENDIX TABLE

Percentage Distribution of the Working Force by Main Activity, 1971-1981

Males

Category	Uttar Pradesh						West Bengal					
	Total		Rural		Urban		Total		Rural		Urban	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
(i) Cultivators	59.10	59.53	67.28	70.06	5.56	8.94	33.58	31.40	45.57	42.87	1.57	1.65
(ii) Agricultural Labourers	17.18	14.15	19.20	15.83	3.99	6.10	25.00	23.69	33.25	31.79	2.95	2.64
(iii) Plantations, Forestry, etc.	0.63	0.52	0.60	0.42	0.92	0.98	2.23	2.69	2.76	3.27	0.80	1.06
(iv) Mining and Quarrying	0.04	0.07	0.03	0.07	0.06	0.07	0.95	0.97	1.24	0.78	0.19	1.45
(va) Household Manufacturing	3.64	3.56	3.10	2.73	7.13	7.55	2.53	3.09	2.44	3.02	2.79	3.25
(vb) Non-household Manufacturing	3.91	5.67	1.58	2.73	19.17	19.79	11.89	13.54	3.77	5.21	33.60	35.20
(vi) Construction	0.67	1.14	0.39	0.60	2.46	3.71	1.05	1.54	0.55	0.93	2.37	3.00
(vii) Trade and Commerce	4.43	4.75	1.92	1.80	20.83	18.91	8.39	9.01	3.17	4.56	22.31	20.55
(viii) Transport, Storage and Communications	1.91	2.14	0.54	0.95	10.88	7.85	4.42	4.41	1.47	1.83	12.31	11.11
(ix) Other Services	8.50	8.46	5.36	4.79	29.09	26.11	9.94	9.71	5.77	5.71	21.10	20.08
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(i) + (ii) + (iii)	76.91	74.20	87.08	86.31	10.47	15.02	60.81	57.73	81.50	77.93	5.32	5.35
(va) + (vb)	6.37	9.23	4.68	5.46	26.30	27.34	14.42	15.63	6.21	8.23	35.39	38.46

MANPOWER ISSUES FOR THE NINETIES

A. K. Dasgupta

Introduction

Manpower issues have roots in demographic features, like age and sex distribution and population growth, in education and training programmes for manpower development and in the characteristics of disposition and utilization of manpower in different activities. All these are governed by independent dynamical relations, while among them there are strong interdependence. Issues emerge primarily from this structural feature of the manpower system, defined as the complex of the above three subsystems. This paper makes an attempt to trace the evolution of the manpower system during the seventies and to identify the basic manpower issues associated with the character of evolution during this period. The insight obtained from this analysis has been used thereafter for evolving the character of manpower issues liable to be faced during the nineties.

The statistical part of the paper consists of presentation of (1) the population and manpower accounts for the year of 1971, bringing out particularly the activity-wise distribution of the population by the levels of education, (2) growth of education and training and the evolution of education composition of population during the decade and (3) population and manpower accounts for the year of 1981 resulting from the 1971 accounts and the educational programmes during the decade.

The Institute (of Applied Manpower Research) is currently engaged, as part of its normal research in manpower analysis, in a programme of research for development of manpower and population accounts for this country for all years beginning with 1971. The statistical tables presented in this paper have all been developed out of the basic tables prepared in that regard. Uses, in general, have been made of the researches in the Divisions under Dr. B.L. Agarwal and Dr. P.N. Mathur, and in particular, by Shri RP. Srivastava, Shri Shashi Kumar, Mrs. Lalita Manocha and Shri R. G. Varshney. Detailed statistical notes covering the tables have not been presented in this paper as these are subjects of separate monographs to be brought out by the Institute.* The figures used in this paper have not been published yet and should, therefore, be treated as provisional; otherwise also, some changes may occur in the figures. In another sense, opportunity is being taken through this paper to provide a first glimpse of the current research work at the Institute to the outsiders.

Section I : Population Account for 1971

Three tables (Table 1, Table 2, Table 3) are presented below showing the distribution of population, separately for males and females, by the activities of their engagement. Data are presented for three age groups of less than 15 years, 15-59 years and more than 60 years. The primary activity classification in these tables are two—socially active and socially inactive. The socially active class is further divided into three groups—engaged in production of marketed/marketable goods and services, engaged in management of household and engaged in studies. The socially inactive class is also divided in two primary groups—socially inactive and not utilisable and socially inactive but utilisable.

The figures for these tables have been taken from Census and Ministry of Education sources and these are benchmarked to primary census totals. The figure for the number of persons engaged in production of marketed/marketable goods and services is the same as the figure given in the census for the number of persons at work. The change of name has a significance. In the Census, as also in the NSS investigation, a person is taken as worker if he is economically active. In the western market/exchange based socially economic activity is unambiguously distinguished from other forms of socially useful activity in that through conduct of the former money in the form of profit or wages is obtained, whereas that is not obtained through conduct of the other activity. In the Indian case money is not brought in to distinguish economic activity from other forms of socially useful activity. The distinction is made instead by providing definite list of activity names and by stipulation that conduct of these would amount to economic activity. Conduct of all other forms of activities by individuals, which may be socially useful otherwise, is not taken as work; and the individuals engaged in such activities are classified as not-at-work.

In the absence of any a priori criteria the list of activities used for distinguishing workers from non-workers is necessarily arbitrary. The classification of persons into workers and non-workers on the basis of such a list is, therefore, equally arbitrary. The only discernable characteristics of the list is that the activities included therein generally are such that their output of goods and services is either marketed in exchange for money or is capable of being marketed if the producers desire. On the other hand, the output of other activities, not included in the list, are also useful but cannot be sold, as there is no market as such for those in India currently. The products

*I am indebted to Shri Shashi Kumar and Shri I.C. Awasthi of the Institute for helping me to produce the relevant tables for this paper.

39—5 RGI/ND/84

and services which are capable of exchange in the Indian market today for money are determined by one set of socio-economic relations, while the allocation of labour input for production of all varieties of goods and services in this society is determined by different set of socio-economic relations. Therefore, there is no justification for determining the content of activity for classification of individuals as workers by reference to the goods and services for which exchange possibilities exist and not with reference to the goods and services which have actually been exchanged in the market for money. The latter is an unambiguous determinant, while the former will be mixed with issues and questions all the time. Therefore, there is also no justification for using such a criteria for separating persons as workers and for putting all others as non-workers in this society.

Thus, for this exercise actual description of activity has been used for classification of individuals. Census data regarding workers have been used for measuring the number of persons engaged in production of marketed/marketable goods and services in place NSS data on the same item for a particular reason. Census has classified both in 1971 and 1981 only those persons as workers who engaged in, what has been called, economic activity as primary occupation in life. As these persons would not be expected to involve in any other form of activity in primary capacity, any one identified as worker today would again be identified as worker tomorrow also by the given criteria. That is to say that the Census classification is person-based and not based on behaviour of individuals on specific time points/periods. In this way, the Census separates out a group of individuals as workers and distinguishes them from the other group, though some of the members of the other group may be seen occasionally doing the jobs of economic workers.

The distinction between Census and NSS approach is most clearly noted in the classification of females. The proportion of females classified as worker by the NSS, using a similar concept of work, is much larger than the proportion obtained from the census data. But from a cross-classification of females by usual and weekly status (32nd round data) it is observed that a large number of females classified as worker by usual status appeared under household work by weekly status classification. Similarly, a significant number of females classified as houseworker by usual status appeared under worker by weekly status. This means that in the NSS data a specific group of females is not identified as worker in any case.

The basic figures, except the figures for the students, have been taken from the Census. Some modifications have been made in the Census figures so as to preserve consistency in each column of figures. Population under 15 years of age has been allowed only three activity statuses—worker, student, too young to work. All persons below the age of 15 years in the Census classes of houseworker, beggars, vagrants, etc., rentiers and other dependent population and the residual others have been transferred under the class of too young to work. The figures for students have been taken from the Ministry of Education sources. For the population above the age of 60 years excluding the persons counted as at-work all others have been put under too-old to work. This includes, therefore, persons above the age of 60 years in the Census classes of houseworker, others, rentiers, pensioners and men of independent means and of beggars, vagrants, etc.

Table 1 : Distribution of Population by Activity categories and by Age group

All India, Male, 1971
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in production of marketed/marketable goods and services	7,892	128,803	12,451	149,146
(b) engaged in management of household	..	852	..	852
(c) engaged in studies	42,392	10,991	..	53,383
Socially inactive and not utilisable				
(a) too young to work	68,625	..	..	68,625
(b) too old to work	..	..	4,423	4,423
(c) Beggars, vagrants, etc.	..	525	..	525
Socially inactive but utilisable				
(a) Others	..	2,765	..	2,765
(b) Rentiers, dependents, persons of independent means, etc.	..	4,330	..	4,330
TOTAL	118,909	148,226	16,874	284,049

Table 2: Distribution of Population by Activity categories and by Age group

All India, Female, 1971
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in productin of marketed/marketable goods and services	2,862	26,816	1,661	31,339
(b) engaged in management of household	..	99,219	..	99,219
(c) engaged in studies	24,499	3,458	..	27,957
Socially inactive and not utilisable				
(a) too young to work	84,065	..	..	84,065
(b) too old to work	..	..	14,164	14,164
(c) Beggars, vagrants, etc.	..	300	..	300
Socially inactive but utilisable				
(a) Others	..	398	..	398
(b) Rentiers, dependents, persons of independent means, etc.	..	6,668	..	6,668
TOTAL	111,426	136,859	15,825	264,110

Table 3: Distribution of Population by Activity categories and by Age group

All India, Persons, 1971
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in production of marketed/marketable goods and services	10,754	155,619	14,112	180,485
(b) engaged in management of household	..	100,071	..	100,071
(c) engaged in studies	66,891	14,449	..	81,340
Socially inactive and not utilisable				
(a) too young to work	152,690	..	..	152,690
(b) too old to work	..	..	18,587	18,587
(c) Beggars, vagrants, etc.	..	825	..	825
Socially inactive but utilisable				
(a) Others	..	3,163	..	3,163
(b) Rentiers, dependents, persons of independent means, etc.	..	10,998	..	10,998
TOTAL	230,335	285,125	32,699	548,159

A table (Table 4) showing the composition of the population, separately for males and females, by the level of education is presented below.

Three additional tables (Table 5, Table 6, Table 7) showing, separately for males and females, the distribution of literate population by activity categories and educational levels have been prepared; and these are presented below.

The distribution of educated persons into different socio-economic activities has been prepared particularly to evaluate the utilisation characteristics of these persons. The education and training are provided by the society because it is believed that the productivity improvement and levels of education and training are positively correlated. The maximum improvement of social productivity is therefore achieved when the educated and trained persons are employed in activities which have potentials for productivity improvement. In that regard, one would expect that the more the educated persons are engaged in the production of marketed/marketable goods and services the more is the prospect of productivity improvement in the

aggregate. The situation would be contrasted with the employment of educated persons in household management. The proportions of various categories of educated persons in different activities have been shown in the table for bringing out the utilisation pattern from the above point of view.

Although the tables have been developed more for comparison of 1971 and 1981 situation, some salient features of the 1971 situation should be noted. For the males the engagement in production of marketed/marketable goods and services and in studies together cover about 80 or more per cent of educated manpower groups. In respect of the females, on the other hand, the proportion engaged in activities which have potential of productivity improvement is very small for each educational category.

Tables (Table 8, Table 9, Table 10) showing the proportion of different categories of educated manpower in different activity forms, separately for males and females are presented.

Table 4: Distribution of Population by Levels of Education and by Sex: All India, 1971

(000s')

Level of education	Male	Female	Total
1	2	3	4
1. Illiterate	172,006 (60.56)	214,739 (81.31)	386,745 (70.55)
2. Literate	112,043 (39.44)	49,371 (18.69)	161,414 (29.45)
(a) Literate but upto primary	73,665 (25.93)	36,858 (13.95)	110,523 (20.17)
(b) Middle	24,049 (8.47)	8,997 (3.41)	33,046 (6.03)
(c) Secondary	11,675 (4.11)	2,857 (1.08)	14,532 (2.65)
(d) Graduate and above	2,654 (0.93)	659 (0.25)	3,313 (0.60)
TOTAL	284,049 (100)	264,110 (100)	548,159 (100)

Table 5: Distribution of Literate Population by Activity category and Educational Level: All India, Males, 1971

(000's)

Activity category	Literate upto primary	Middle	Secondary	Graduate and above	Total
1	2	3	4	5	6
1. *Socially active*	64,624 (87.73)	20,053 (83.38)	10,059 (86.16)	2,202 (82.97)	96,938 (86.52)
(a) engaged in production of marketed/marketable goods and services	40,280 (54.68)	13,838 (57.54)	7,369 (63.12)	2,051 (77.28)	63,538 (56.71)
(b) engaged in management of household	221 (0.30)	91 (0.38)	68 (0.58)	7 (0.26)	387 (0.35)
(c) engaged in studies	24,123 (32.75)	6,124 (25.46)	2,622 (22.46)	144 (5.43)	33,013 (29.46)
2. *Socially inactive and not utilisable*	7,459 (10.12)	2,448 (10.18)	330 (2.83)	96 (3.62)	10,333 (9.22)
(a) too young	6,322 (8.58)	2,153 (8.95)	97 (0.83)	..	8,572) (7.65)
(b) too old	1,020 (1.38)	202 (0.84)	149 (1.28)	70 (2.64)	1441 (1.29)
(c) Beggars, vagrants etc.	117 (0.16)	93 (0.39)	84 (0.72)	26 (0.98)	320 (0.28)
3. *Socially inactive but utilisable*	1,582 (2.15)	1,548 (6.44)	1,286 (11.01)	356 (13.41)	4,772 (4.26)
TOTAL	73,665 (100)	24,049 (100)	11,675 (100)	2,654 (100)	112,043 (100)

Table 6 : Distribution of Literate Population by Activity category and Educational Level: All India, Females, 1971

(000's)

Activity category	Literate upto primary	Middle	Secondary	Graduate and above	Total
1	2	3	4	5	6
1. *Socially active*	28,684	7,376	2,599	610	39,269
	(77.82)	(81.98)	(90.97)	(92.56)	(79.54)
(a) engaged in production of marketed/marketable goods and services	2,238	609	445	220	3,512
	(6.07)	(6.77)	(15.58)	(33.38)	(7.11)
(b) engaged in management of household	14,326	4,500	1,448	344	20,618
	(38.87)	(50.01)	(50.68)	(52.20)	(41.76)
(c) engaged in studies	12,120	2267	705	45	15,139
	(32.88)	(25.20)	(24.71)	(6.93)	(30.67)
2. *Socially inactive and not utilisable*	7,361	1,392	73	5	8,831
	(19.97)	(15.47)	(2.56)	(0.76)	(17.89)
(a) too young	6,450	1,319	47	..	7,816
	(17.50)	(14.66)	(1.65)		(15.83)
(b) too old	877	67	22	5	971
	(2.38)	(0.74)	(0.77)	(0.76)	(1.97)
(c) Beggars, vagrants, etc.	34	6	4	..	44
	(0.09)	(0.07)	(0.14)		(0.09)
3. *Socially inactive but utilisable*	813	229	185	44	1,271
	(2.21)	(2.55)	(6.47)	(6.68)	(2.57)
TOTAL	36,858	8,997	2,857	659	49,371
	(100)	(100)	(100)	(100)	(100)

Table 7 : Distribution of Literate Population by Activity category and Educational Level: Ali India, Persons, 1971

(000's)

Activity category	Literate upto primary	Middle	Secondary	Graduate and above	Total
1	2	3	4	5	6
1. *Socially active*	93,308(84.42)	27,429(83.00)	12,658(87.10)	2,812(84.88)	136,207(84.38)
(a) engaged in production of marketed/marketable goods and services	42,518(38.47)	14,447(43.77)	/,814(53.77)	2,271(68.56)	67,050(41.54)
(b) engaged in management of household	14,547(13.16)	4,591(13.89)	1,516(10.43)	351(10.59)	21,005(13.01)
(c) engaged in studies	36,243(32.79)	8,391(25.39)	3,328(22.90)	190(5.73)	48,152(29.83)
2. *Socially inactive and not utilisable*	14,820(13.41)	3,840(11.62)	403(2.78)	101(3.05)	19,164(11.87)
(a) too young	12,772(11.55)	3,472(10.51)	144(0.99)		16,388(10.15)
(b) too old	1,897(1.72)	269(0.81)	171(1.18)	75(2.27)	2,412 (1.49)
(c) Beggars, vagrants, etc.	151(0.14)	99(0.30)	88(0.61)	26 (0.78)	364 (0.23)
3. *Socially inactive but utilisable*	2,395(2.17)	1,777(5.38)	1,471(10.12)	400(12.07)	6,043 (3.75)
TOTAL	110,523(100)	33,046(100)	14,532(100)	3,313(100)	161,414(100)

Table 8 : Percentage Distribution of Total Population by Educational Level and by Activity 1971

All India, Male (000's)

Educational level	Production of marketed/ marketable goods and services	House work	Socially inactive but utilisable			House work & socially inactive but utilisable
			Rentiers, dependents & persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate . . .	85,608(57.40)	465(54.58)	1,685(38.92)	637(23.04)	2,322(32.73)	2,787(35.07)
2. Literate . . .	63,538(42.60)	387(45.42)	2,644(61.08)	2,128(76.96)	4,772(67.27)	5,159(64.93)
(a) Literate but upto primary	40,280(27.00)	221(25.94)	969(22.39)	613(22.17)	1,582(22.30)	1,803(22.69)
(b) Middle . .	13,838 (9.28)	91(10.68)	771(17.81)	777(28.10)	1,548(21.82)	1,639 (20.63)
(c) Secondary . .	7,369 (4.94)	68 (7.98)	691(15.96)	595(21.52)	1,286(18.13)	1,354(17.04)
(d) Graduate & above	2,051 (1.38)	7 (0.82)	213 (4.92)	143 (5.17)	356 (5.02)	363 (4.57)
TOTAL	149,146(100.00)	852(100.00)	4,329(100.00)	2,765(100.00)	7,094(100.00)	7,946(100.00)

Table 9 : Percentage Distribution of Total Population by Educational Level and by Activity, 1971

All India, Female (000's)

Educational level	Production of marketed/ marketable goods and services	House work	Socially inactive but utilisable			House work & socially inactive but utilisable
			Rentiers, dependents & persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate . . .	27,827(88.79)	78,579(79.22)	5,704(85.27)	112(28.14)	5,816(82.07)	84,395(79.41)
2. Literate . . .	3,512(11.21)	20,618(20.78)	985(14.73)	286(71.86)	1,271(17.93)	21,889(20.59)
(a) Literate but upto Primary	2,238(7.15)	14,326(14.43)	767(11.47)	46(11.56)	813(11.47)	15,139(14.24)
(b) Middle . .	609(1.94)	4,500 (4.54)	133 (1.99)	96(24.12)	299 (3.23)	4,729 (4.45)
(c) Secondary . .	445(1.42)	1,448 (1.46)	77 (1·15)	108(27.13)	185 (2.61)	1,633 (1.54)
(d) Graduate & above . .	229(0.70)	344 (0.35)	8 (0.12)	36 (9.05)	44 (0.62)	388 (0.36)
TOTAL .	31,339(100.00)	99,197(100.00)	6,689(100.00)	398(100.00)	7,087(100.00)	106,284(100.00)

Table 10 : Percentage Distribution of Total Population by Educational Level and by Activity, 1971

All India, Persons (000's)

Educational level	Production of marketed/ marketable goods and services	House work	Socially inactive but utilisable			House work & socially inactive but utilisable
			Rentiers, dependents & persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate . . .	113,435(62.85)	79,044(79.01)	7,389(67.06)	7,49(23.68)	8,138(57.39)	87,182(76.32)
2. Literate . . .	67,050(37.15)	21,005(20.99)	3,629(32.94)	2,414(76.32)	6,043(42.61)	27,048(23.68)
(a) Literate but upto primary	42,518(23.56)	14,547(14 54)	1,736(15.76)	659(20.83)	2,395(16.89)	16,942(14.83)
(b) Middle . . .	14,447(8.00)	4,591(4.58)	904(8.20)	873(27.60)	1,777(12.53)	6,368(5.58)
(c) Secondary . .	7,814(4.33)	1,516(1.52)	768(6.97)	702(22.23)	1,471(10.37)	2,987(2.61)
(d) Graduate and above	2,271(1.26)	351(0.35)	221(2.01)	179(5.66)	400(2.82)	751(0.66
TOTAL .	180,485(100.00)	100,049(100.00)	11,018(100.00)	3,163(100.00)	14,181(100.00)	114,230(100.00)

Section II : Manpower Development during the seventies

During the decade of 1971-81 rapid improvement in the field of education and training occurred. The extent of improvement is readable from data on enrolment in different types and levels of education. Generally a distinction can be made between education and training under the university system and that outside the university system. The university system in India covers the general education upto the secondary stage in the schools and higher education in the colleges leading to degree diploma or certificates awarded by the universities in India. The higher education programme under the universities is further divisible into general education and professional and technical education. In both lines educational courses at the graduate (first degree) and post graduate levels are provided by the universities.

The higher general educational line provides courses in subjects under humanities and arts and commerce and in subjects under Science. In most universities in the first degree course under the higher general educational programme is of three years duration to be availed by individuals after secondary education of twelve years duration (10+2). In some states secondary education continues to be of eleven years duration; though a uniform pattern of (10+2) is expected to emerge shortly in all states. The post graduate education leading to Master's degree in all the subjects for which first degree courses are available take additional two years in the universities.

The professional and technical educational courses provided by the universities can also be availed by individuals after secondary education. The first degree courses in the subjects under this group can be completed in four or five years depending on the subject of study. Post graduate courses in professional and technical subjects leading to Masters degree or dimploma are provided in the professional colleges; and the duration of the course varies with the level and the subject of education.

Secondary education pattern is nearly uniform in the country in term of course content; but the duration and stage distribution vary significantly. The stages are generally separated as primary, middle, secondary and higher secondary.

A variety of education and training courses are provided outside the university system. Generally, the subjects covered will fall under the branches of arts and crafts, professional and technical. These courses are basically occupation-linked. These courses vary as regards level and duration: and in all cases a preliminary level of university based general education is required for entry into these courses. These, therefore, constitute, in a way, branching off of the educational lines for the society, the branching occurring at different stages.

By and large, the schools providing courses in the above subjects are under Government control; in most cases the courses are also managed through different ministerial departments. In particular, the Ministries of Labour, Health and Family Welfare, Industry and Agriculture in the Centre and the States are involved in arranging and conducting education in these areas.

From the side of manpower analysis one can divide, the total education and training facilities available in this society into two parts—facilities for general education and that for professional and technical education. The general education facilities are wholly under the university system; while the professional and technical educational facilities are available both under the university system and the non-university system. The tables (Table 11 and Table 12) showing, separately for

males and females, the growth of enrolment in the two branches of education during the decade of 1971-81 are presented below.

The preponderance of enrolment under the university system and also in general education courses is evident from the tables. As a matter of fact, the enrolment in the courses under professional education has been also very small in absolute terms. The rate of growth of enrolment in the courses under general education has also been higher than the rate in respect of the professional courses. This is read from the index values with 1971 as 100 provided in the tables.

Courses in general education at the post secondary level is broken into three channels—Arts, Science and Commerce. The Commerce course, by and large, is a professional course, though the courses offered at the universities are so general that these are not identifiable with any commercial profession particularly. Two tables (Table 13, Table 14) showing the enrolment in general education, separately for males and females are provided below.

A table (Table 15) for the field of professional education has also been provided. The enrolment figures for these tables have been formed by combining the enrolment under both systems—university and non-university. Significantly, however, the professional courses under the university system are mostly below graduate level; and there are also secondary level courses under this field. Therefore, the course levels vary considerably in this field of education.

The stocks of educated persons of different categories are built up from the data on enrolment and outturn, the drop out pattern in the educational system, and the attrition behaviour. Estimates of stocks of educated manpower categories have been prepared. These have been prepared by levels of education for different educational types. Data regarding specific categories are presented below.

Table 11: Yearwise Enrolment in General and Professional Education

All India, Male (in 000's)

Year	Gen. Education		Professional: Under Univ. System		Vocational: Under Non-Univ. System		Total Professional		Univ. System Total		Grand Total	
	Number	Index	Number*	Index	Number**	Index	Number	Index	Number	Index	Number	Index
1970-71	7904	100.00	328	100.00	432	100·00	760	100·00	8232	100·00	8664	100·00
1971-72	8539	108.03	343	104.57	413	95·60	756	99·47	8882	107·90	9295	104·86
1972-73	8861	112.11	362	110.37	447	103·47	809	106·45	9223	112·04	9670	109·09
1973-74	9066	114.70	390	118.90	471	109·03	861	113·29	9456	114·87	9927	111·99
1974-75	9273	117.32	416	126.83	488	112·96	904	118·95	9689	117·70	10177	114·81
1975-76	9560	120.95	436	132.93	494	114·35	930	122·37	9996	121·43	10490	118·34
1976-77	9821	124.25	432	131.71	495	114·58	927	121·97	10253	124·55	10748	121·25
1977-78	10141	128.30	455	138.72	533	123·38	988	130·00	10596	128·72	11129	125·55
1978-79	10457	132.30	459	139.94	568	131·48	1027	135·13	10916	132·60	11484	129·56
1979-80	10739	135.87	483	147.26	583	134·95	1066	140·26	11222	136·32	11805	133·18
1980-81	10119	139.41	507	154.57	600	138·88	1107	145·66	11526	140·01	12126	136·80

*Undergraduate and Undergraduate Diploma/Certificate have been excluded.

**Undergraduate and Undergraduate Diploma/Certificate have been included.

Table 12: Yearwise Enrolment in General and Professional Education

All India, Female (in 000's)

Year	Gen. Education		Professional: Under Univ. System		Vocational: Under Non-Univ. System		Total Professional		Univ. System Total		Grand Total	
	Number	Index	Number*	Index	Number**	Index	Number	Index	Number	Index	Number	Index
1970-71	2760	100.00	49	100.00	161	100.00	218	100.00	2817	100.00	2978	100.00
1971-72	3019	109.07	48	97.96	160	99.38	208	99.05	3067	108.87	3227	108.36
1972-73	3174	114.68	56	114.29	162	100.62	218	103.81	3230	114.66	3392	113.90
1973-74	3357	121.28	58	118.37	168	104.35	226	107.62	3415	121.23	3583	120.32
1974-75	3541	127.92	62	126.53	172	106.83	234	111.43	3603	127.90	3775	126.76
1975-76	3682	133.02	68	138.78	176	109.32	244	116.19	3750	133.12	3926	126.76
1976-77	3858	139.38	71	144.90	189	117.39	260	123.81	3929	139.47	4118	138.28
1977-78	4045	146.13	80	163.27	194	120.50	274	130.48	4125	146.43	4319	145.03
1978-79	4227	152.71	83	169.39	198	122.98	281	133.81	4310	153.00	4508	151.38
1979-80	4402	159.03	86	175.51	198	122.98	284	135.24	4488	159.32	4686	157.35
1980-81	4577	165.35	91	185.71	214	132.98	305	145.24	4668	165.71	4882	163.94

*Undergrdauate & Undergraduate Diploma/Certificate have been excluded.

**Undergraduate & Undergraduate Diploma/Certificate have been included.

Table 13: Yearwise Enrolment in Post-Secondary but below Graduate level and Graduate and above by level field of study

All India, Male (000's)

Year	Post-Secondary but below Graduate				Graduate and above				Grand Total
	Science	Arts	Commerce	Total	Science	Arts	Commerce	Total	
1970-71	274 (29.81)	525 (57.13)	120 (13.06)	919 (100.00)	437 (34.90)	573 (45.77)	242 (19.33)	1252 (100.00)	2171
1971-72	329 (30.32)	630 (58.07)	126 (11.61)	1085 (100.00)	429 (32.55)	605 (45.90)	284 (21.55)	1318 (100.00)	2403
1972-73	413 (35.10)	619 (52.59)	145 (12.32)	1177 (100.00)	421 (30.18)	662 (47.46)	312 (22.36)	1395 (100.00)	2572
1973-74	401 (32.55)	673 (54.63)	158 (12.82)	1232 (100.00)	410 (28.47)	686 (47.64)	344 (23.89)	1440 (100.00)	2672
1974-75	389 (30.20)	728 (56.52)	171 (13.28)	1288 (100.00)	399 (26.89)	710 (47.84)	375 (25.27)	1484 (100.00)	2772
1975-76	409 (30.87)	738 (55.70)	178 (13.43)	1325 (100.00)	387 (26.25)	705 (47.84)	382 (25.91)	1474 (100.00)	2799
1976-77	443 (29.91)	815 (55.03)	223 (15.06)	1481 (100.00)	374 (25.32)	696 (47.12)	407 (47.56)	1477 (100.00)	2958
1977-78	379 (23.04)	1013 (61.58)	253 (15.38)	1645 (100.00)	372 (24.36)	733 (48.00)	422 (27.64)	1527 (100.00)	3172
1978-79	388 (23.07)	1036 (61.59)	248 (15.34)	1682 (100.00)	386 (24.41)	758 (47.95)	437 (27.64)	1581 (100.00)	3263
1979-80	407 (23.07)	1086 (61.57)	271 (15.36)	1764 (100.00)	394 (24.37)	776 (47.99)	447 (27.64)	1617 (100.00)	3381
1980-81	425 (23.05)	1135 (61.55)	284 (15.40)	1844 (100.00)	403 (24.38)	793 (47.97)	457 (27.65)	1653 (100.00)	3497

Table 14 : Yearwise Enrolment in Post-Secondary but below Graduate level and Graduate and above level by field of study

All India, Female (000's)

Year	Post-Secondary but below Graduate				Graduate and above				Grand Total
	Science	Arts	Commerce	Total	Science	Arts	Commerce	Total	
1970-71	60 (25.10)	162 (67.79)	17 (7.11)	239 (100.00)	108 (27.27)	282 (71.22)	6 (1.51)	396 (100.00)	635
1971-72	74 (25.60)	197 (68.17)	18 (6.23)	289 (100.00)	104 (24.70)	306 (72.69)	11 (2.61)	421 (100.00)	710
1972-73	95 (30.35)	199 (63.58)	19 (6.07)	313 (100.00)	107 (23.31)	338 (73.64)	14 (3.05)	459 (100.00)	772
1973-74	101 (29.19)	223 (64.45)	22 (6.36)	346 (100.00)	110 (22.49)	361 (73.83)	18 (3.68)	489 (100.00)	835
1974-75	106 (27.97)	248 (65.44)	25 (6.59)	379 (100.00)	113 (21.77)	384 (73.99)	22 (4.24)	519 (100.00)	898
1975-76	112 (28.50)	251 (63.87)	30 (7.63)	393 (100.00)	116 (21.64)	394 (73.51)	26 (4.85)	536 (100.00)	929
1976-77	117 (24.42)	310 (64.72)	52 (10.86)	479 (100.00)	120 (20.80)	421 (72.96)	36 (6 24)	577 (100.00)	1056
1977-78	122 (22.59)	352 (65.19)	66 (12.22)	540 (100.00)	122 (20.33)	433 (72.17)	45 (7.50)	600 (100.00)	1140
1978-79	124 (22.54)	359 (65.28)	67 (12.18)	550 (100.00)	129 (20.35)	457 (72.08)	48 (7.57)	634 (100.00)	1184
1979-80	133 (22.58)	384 (65.20)	72 (12.22)	589 (100.00)	135 (20.39)	477 (72.06)	50 (7.55)	662 (100.00)	1251
1980-81	141 (22.60)	407 (65.22)	76 (12.18)	624 (100.00)	141 (20.35)	500 (72.15)	52 (7.50)	693 (100.00)	1317

Table 15 : Yearwise Distribution of Total Students by Professional Courses

All India (000's)

Year	Secondary but below Graduate							Graduate and above								Grand Total
	Engg.	Medicine	Agri. Forestry	Vet. Science	Education	Others	Sub Total	Engg.	Medicine	Agri. Forestry	Vet. Science	Education	Lib. Science	Law	Others	Sub Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1970-71 . .	203	33	6	1	123	47	413	98	89	34	6	59	NA	77	31	393	806
1971-72 . .	179	31	8	Neg.	116	45	379	95	97	33	5	61	NA	88	30	409	788
1972-73 . .	224	35	7	1	108	43	418	96	99	31	5	67	NA	104	30	435	853
1973-74 . .	237	36	7	Neg.	112	53	445	100	103	31	5	73	NA	120	34	467	912
1974-75 . .	240	34	7	Neg.	114	61	466	105	107	30	6	78	NA	136	37	498	964
1975-76 . .	269	35	7	Neg.	106	50	467	111	111	32	6	80	NA	143	42	525	992
1976-77 . .	266	46	3	Neg.	103	38	456	116	118	32	7	76	2	139	41	531	987
1977-78 . .	301	49	2	Neg.	103	53	508	119	120	32	7	73	2	160	51	564	1072
1978-79 . .	303	50	2	1	104	53	513	126	127	35	7	78	2	176	54	599	1112
1979-80 . .	310	50	2	1	106	54	523	133	133	36	7	81	2	180	56	628	1151
1980-81 . .	321	55	2	1	113	58	550	140	139	38	8	85	3	187	60	660	1210

Table 16 : Estimated stock of educated manpower for selected educated manpower categories of the level of graduate and above

All India, 1981 (000's)

Manpower Categories	Estimated Stock
Arts	4357
Science	1684
Commerce	1210
Engineering & Technology	308
Medical	221
Agriculture	102
Veterinary	24
Others	52

In the above table one notes that the three subjects of Arts, Science and Commerce, which come under the broad area of general education, cover about 92 per cent of the total. The professional subjects cover remaining eight per cent of the stock of graduates and above. The behaviour of relative enrolment in professional and non-professional subjects during the decade also remained similar. In 1971 the graduates of professional subjects education (38 lakhs) was a little more than ten per cent of the total (329 lakhs). During the decade, therefore, the weight of professionally educated manpower in the total educated manpower of the level of graduate and above declined.

Section III : Manpower Accounts for 1981

Three tables (Table 17, Table 18, Table 19) showing the distribution of population by activity categories and by age groups have been prepared; and are presented below. These are on the same lines of classification as the tables relating to the year of 1971. The basic population figures for these tables have been taken from 1981 population census. The age distribution of the population has been based on the following two assumptions; the proportion of population below the age of 15 years remains unchanged during the dacade, and that the proportion of population above the age of 60 years increases as per the pattern visualized in the Expert Committee's population projection. The figures for students have been obtained by projection of data available from the Ministry of Education sources. Help has also been taken from data provided by the NSS 27th and 32nd round surveys.

Besides these tables, additional tables (Table 20, Table 21, Table 22) showing the distribution of the population by activity and by levels of education have also been prepared. For this purpose estimates of stocks of persons with different levels of education prepared at the Institute have been used. Data from the earlier Census and the above mentioned NSS surveys have been used extensively for developing these tables.

Some features of the changes in the education/activity distribution of the population during the decade may be noted. The education composition of the males engaged in production of marketed/marketable goods and services changed significantly in favour of higher education intensity. Individuals with secondary and above level of education constituted six per cent of the total individuals in this activity in 1971. The figure increased to 11 per cent in 1981. The literacy rate as a whole increased from about 43 per cent to 50 per cent during the period. Similar changes occurred also regarding the component of females engaged in production of marketed/marketable goods and services. Individuals with secondary and higher levels of education formed about two per cent of the total individuals in 1971 which increased to about four per cent in 1981.

Table 17 : Distribution of Population by Activity categories and by Age group

All India, Male, 1981
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in production of marketed/marketable goods and services	9,562	155,027	16,166	180,755
(b) engaged in management of household	..	1,060	..	1,060
(c) engaged in studies	56,001	14,870	..	70,871
Socially inactive and not utilisable				
(a) too young to work	82,454	..	..	82,454
(b) too old to work	..	..	6,394	6,394
(c) Beggars, vagrants, etc.	..	672	..	672
Socially inactive but utilisable				
(a) Others	..	4,306	..	4,306
(b) Rentiers, dependents, persons of independent means, etc.	..	7,089	..	7,089
TOTAL	148,017	183,024	22,560	353,601

Table 18: Distribution of Population by Activity categories and by Age group

All India, Female, 1981
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in production of marketed/marketable goods and services	4,282	39,934	2,660	46,876
(b) engaged in management of household	..	115,176	..	115,176
(c) engaged in studies	34,780	5,600	..	40,380
Socially inactive and not utilisable				
(a) too young to work	100,414	...	...	100,414
(b) too old to work	..	..	18,498	18,498
(c) Beggars, vagrants, etc.	..	375	..	375
Socially inactive but utilisable				
(a) Others	..	498	..	498
(b) Rentiers, dependents, persons of independent means, etc.	..	8,373	..	8,373
TOTAL	139,476	169,956	21,158	330,590

Table 19 : Distribution of Population by Activity categories and by Age group

All India, Persons, 1981
(Fig. in 000's)

Activity category	Less than 15 years	15—59 years	60 years and more	Total
1	2	3	4	5
Socially active				
(a) engaged in production of marketed/marketable goods and services	13,844	194,961	18,826	227,631
(b) engaged in management of household	..	116,236	..	116,236
(c) engaged in studies	90,781	20,470	..	111,251
Socially inactive and not utilisable				
(a) too young to work	182,868	.	.	182,868
(b) too old to work	.	..	24,892	24,892
(c) Beggars, vagrants, etc.	..	1,047	..	1,047
Socially inactive but utilisable				
(a) Others	..	4,804	..	4,804
(b) Rentiers, dependents, persons of independent means, etc.	..	15,462	..	15,462
TOTAL	287,493	352,980	43,718	684,191

Table 20 : Distribution of Total Population by Educational Level and Activity, 1981

All India, Male (Fig. in 000's)

Educational level	Production of marketed/ marketable goods and services	House work	Socially inactive but utilisable			House work and socially inactive but utilisable
			Rentiers, dependents and persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate	90,699	579	1,872	992	2,864	3,443
	(50.18)	(54.62)	(26.15)	(23.64)	(24.98)	(27.49)
2. Literate	90,056	481	5,288	3,314	8,602	9,083
	(49.82)	(45.38)	(73.85)	(76.96)	(75.02)	(72.51)
(a) Literate but upto Primary	49,255	274	978	955	1,933	2,207
	(27.25)	(25.85)	(13.67)	(22.18)	(16.86)	(17.62)
(b) Middle	21,605	113	1,863	1,210	3,073	3,186
	(11.95)	(10.66)	(26.02)	(28.10)	(26.86)	(25.43)
(c) Secondary	14,579	85	1,767	926	2,693	2,778
	(8.07)	(8.02)	(24.68)	(21.50)	(23.48)	(22.18)
(d) Graduate and above	4,617	9	680	223	903	912
	(2.55)	(0.85)	(9.48)	(5.18)	(7.88)	(7.28)
TOTAL	180,755	1,060	7,160	4,306	11,466	12,526
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Table 21 : Distribution of Total Population by Educational Level and Activity, 1981

All India, Female (Fig. in 000's)

Educational level	Production of marketed/ marketable goods and Services	House work	Socially in active but utilisable			House work and socially inactive but utilisable
			Rentiers, dependents and persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate	40,737	80,921	7,140	140	7,280	88,201
	(86.90)	(70.25)	(85.27)	(28.11)	(82.07)	(71.09)
2. Literate	6,139	34,276	1,233	358	1,591	35,867
	(13.10)	(29.75)	(14.73)	(71.89)	(17.93)	(28.91)
(a) Literate but upto primary	3,411	20,968	960	58	1,018	21,986
	(7.28)	(18.20)	(11.47)	(11.65)	(11.48)	(17.73)
(b) Middle	979	8,015	166	120	286	8,301
	(2.09)	(6.96)	(1.98)	(24.10)	(3.21)	(6.69)
(c) Secondary	1,088	4,139	97	135	232	4,371
	(2.32)	(3.59)	(1.16)	(27.10)	(2.62)	(3.52)
(d) Graduate and above	661	1,154	10	45	55	1,209
	(1.41)	(1.00)	(0.12)	(9.04)	(0.62)	(0.97)
TOTAL	46,876	115,197	8,373	498	8,871	124,068
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Table 22 : Distribution of Total Population by Educational Level and Activity, 1981

All India, Persons (Fig. in 000's)

Educational level	Production of marketed/ marketable goods and services	House work	Socially inactive but utilisable			House work and socially inactive but utilisable
			Rentiers, dependents and persons of independent means	Others	Total	
1	2	3	4	5	6	7
1. Illiterate	131,436	81,500	9,012	1,132	10,144	91,644
	(57.74)	(70.10)	(58.02)	(23.56)	(49.88)	(67.09)
2. Literate	96,195	3,475	6,521	3,672	1,0193	44,950
	(42.26)	(29.90)	(41,98)	(76.44)	(50.12)	(32.91)
(a) Literate but upto primary	52,666	21,242	1,938	1,013	2,951	24,193
	(23.14)	(18.28)	(12.48)	(21.09)	(14.51)	(17.71)
(b) Middle	22,584	8,128	2,029	1,330	3,359	11,487
	(9.92)	(6.99)	(13.06)	(27.69)	(16.52)	(8.42)
(c) Secondary	15,667	4,224	1,864	1,061	2,925	7,149
	(6.88)	(3.63)	(12.00)	(22.08)	(14.38)	(5.23)
(d) Graduate and above	5,278	1,163	690	268	958	2,121
	(2.32)	(1.00)	(4.44)	(5.58)	(4.71)	(1.55)
TOTAL	227,631	116,257	15,533	4,804	20,337	136,594
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

The education intensity of the persons grouped as socially inactive but available also increased during this period. Literacy rate in respect of the males in this group increased from 67 per cent to 77 per cent. Individuals with secondary and above level of education among the males in this group formed about 23 per cent of the males in this group. This figure increased to about 31 per cent for the year 1981. In respect of the females in this group, the education composition did not show much change.

In the tables a group has been formed combining the components of housework and socially inactive but available. In respect of females in this combined group, changes in the education composition are observed. The literacy rate increased from 21 per cent in 1971 to 29 per cent in 1981. The percentage of individuals with secondary or higher levels of education in the total also increased from about two per cent in 1971 to about four per cent in 1981.

Section IV : Salient Features of the manpower situation of the seventies

The manpower accounts developed for the two years of 1971 and 1981 bring out a variety of interesting aspects of the evolution during the decade. The first thing worth noting in this regard is the change in the educational composition of the population during this period consequent on the manpower developmental programme (Table 23).

During this decade the literacy rate has increased from 29 per cent to 35 per cent. More pertinently, the education intensity of population has increased considerably; the per cent of population with advanced level of education, i.e., graduation and above, in respect of both male and female, has increased relatively to 1971 significantly. Significant increases have occurred for other educational levels also. The uses society made of these persons are, however, important areas of knowledge from the manpower side.

In general, the use of educated persons can be looked at from two sides. There are a variety of socio-economic activities, which due to the nature of the activities themselves, allow productivity improvement through improvement of technology and knowledge content of the work force. In these activities, assuming commensurate technological improvement, an increase of productivity of labour is associated with a rise of education and training intensity of the work force. In particular, the manufacturing activities fall in this class. Among the manufacturing activities, the non-household based activities are more prone to the effects of education and training input than the household based manufacturing activities. The household-based manufacturing activities are, however, capable of obtaining benefits of additional knowledge input, and correspondingly, of additional education/training of the work force. The agriculture is also capable of benefiting considerably from educational input, so also the public utility services.

Table 23 : Showing the education composition of the population years 1971 and 1981

Educational Level	1971			1981		
	Males	Females	Total	Males	Females	Total
1	2	3	4	5	6	7
1. Illiterate	60.56	81.31	70.55	55.09	76.12	65.25
2. Literate	39.44	18·69	29.45	44.91	23.88	34.75
(a) Graduate & above	0.93	0.25	0.60	1.69	0.60	1.16
(b) Secondary but below graduate	4.11	1.08	2.65	6.25	2.11	4.25
(c) Middle but below secondary	8.47	3.41	6.03	10.18	4.38	7.38
(d) Others	25.93	13.95	20.17	26.79	16.79	21.96
TOTAL	(100)	(100)	(100)	(100)	(100)	(100)

By and large, therefore, the individuals defined as economic worker in the Census, can be taken to be involved in activities productivity of labour in which increases with education intensity of the work force. The proportion of educated persons among this component of socially active population is a measure, therefore, of the benefit of educated manpower in the economy. It thus follows that with the increase of the proportion of educated persons in the total population the proportion of educated persons in the total workers (Census defined) should increase as an indication that the society is taking advantage of the increasing availability of educated manpower.

In one sense this increase would require to be compared, however, with the change of the proportion of educated persons in other dispositions excluding studies. Employment of educated persons in these other dispositions, which cover also inactivities, does not lead to any productivity improvement. Therefore, a rational course of behaviour would be an increase in the proportion of educated persons in the activities which allow productivity improvement with increase of education input and a decrease in the proportion of educated persons in the other dispositions. For the years 1971 and 1981 three tables in this regard have been prepared; and these are presented below (Tables 24, 25 and 26).

It is noted from the above set of tables that the per cent of individuals with higher level of education increased during the decade in both forms of uses. An immediate interpretation of the situation is that the society did not take full advantage of the supplies of educated persons provided by the educational institutions. That is to say that generally no bias, from the side of the Society, was evidenced in favour of employment of highly educated persons in activities prone to productivity improvement (knowledge sensitive).

Table 24 : Per cent of educated person in the total employment in the activities allowing for productivity improvement (A) and in other activities (B) by levels of educated persons for the years 1971 and 1981

All India : Male

Educational Level	1971		1981	
	A	B	A	B
1. Illiterate	57.40	64.04	50.18	60.23
2. Literate	42.60	35.96	49.82	39.77
(a) Below middle	27.00	24.75	27.55	26.30
(b) Middle but below secondary	9.28	7.57	11.65	8.33
(c) Secondary but below graduate	4.94	3.19	8.07	4.35
(d) Graduate and above	1.38	0.45	2.55	0.79
TOTAL	100	100	100	100

Table 25 : Per cent of educated person in the total employment in the activities allowing for productivity improvement (A) and in other activities (B) by levels of educated persons for the years 1971 and 1981

All India: Female

Educational Level	1971		1981	
	A	B	A	B
1. Illiterate	88.79	80.30	86.90	74.34
2. Literate	11.21	19.70	13.10	25.66
(a) Below middle	7.15	14.87	7.28	18.36
(b) Middle but below secondary	1.94	3.60	2.09	4.75
(c) Secondary but below graduate	1.42	1.04	2.32	2.08
(d) Graduate and above	0.70	0.19	1.41	0.47
TOTAL	100	100	100	100

Table 26 : Per cent of educated person in the total employment in the activities allowing for productivity improvement (A) and in other activities (B) by levels of educated persons for the years 1971 and 1981

All India : Persons

Educational Level	1971		1981	
	A	B	A	B
1. Illiterate	62.85	74.33	57.74	69.00
2. Literate	37.15	25.67	42.26	31.00
(a) Below middle	23.56	18.50	23.14	21.36
(b) Middle but below secondary	8.00	5.06	9.92	6.11
(c) Secondary but below graduate	4.33	1.83	6.88	2.94
(d) Graduate and above	1.26	0.28	2.32	0.59
TOTAL	100	100	100	100

An absolute bias for choice of highly educated person in an activity form would show up in absorption in the activity of all available highly educated persons in the stock. This would leave out only the component staying for still higher education and that which is retired due to old age. By this consideration, the proportion of educated persons in the knowledge sensitive activities should have increased and the proportion of highly educated persons in all other activities should have decreased in 1981 instead of increasing. As per the data this has not happened. Table 27, Table 28, Table 29 showing the relative distribution of highly educated persons in three form of activities are presented below.

One observes from the above set of tables that during the decade of 1971-1981 the per cent of workers among the graduates, in respect of both males and females, did not change. The per cent of student among graduates, again, in respect of both males and females, decreased during the period. The compensation for the decrease in this regard has gone all to the activity category *others* which cover inactivity and such activities productivity in which has no relationship with educational input.

The fact that the per cent of highly educated persons among the persons employed in the knowledge sensitive activities increased during the decade requires, however, an explanation; for, this increase in the percentage could also be read as an indication of the society's preference for highly educated persons in knowledge sensitive activities. A relevant question in this regard is whether the increase in the percentage figure could arise from increase in the proportion of educated persons in the population which occurred during the decade. The answer would depend on the point that even if the employers were to be indifferent while taking persons for employment about the educational achievements of the individuals in the same way as they would be generally indifferent about the height, weight, colour of the skin, etc., the education-wise composition of the workers would still depend upon the education-wise composition of the population from which the workers are drawn. In particular, the per cent of, say graduates in the total population and the per cent of graduates in the total workers should be equal, provided workers are drawn randomly from the entire population regardlessly of their educational qualifications. A bias is discernable if, on the other hand, the two percentage figures are different from each other. A preference for graduates would be indicated with the figure in respect of worker higher than the other figure; and the converse otherwise.

A set of six tables is presented in the next section in which the appropriate figures have been given, separately for the educational levels of graduates and above and secondary but below graduate. As the workers are drawn usually from the population above the age of 15 years the figure for population above the age of 15 years has been used for estimating the different co-efficients. Moreover, the educational

Table 27: Showing the activity-wise relative distribution of educated persons in the years of 1971 and 1981

All India : Male

Activity categories	1971		1981	
	Graduate and above	Secondary but below graduate	Graduate and above	Secondary but below graduate
Engaged in activities with productivity increase potentials	77.28	63.12	77.29	66.00
Studies	5.43	22.46	4.45	18.80
Others	17.29	14.42	18.26	15.20
TOTAL	100	100	100	100

Table 28 : Showing the activity-wise relative distribution of educated persons in the years of 1971 and 1981

All India : Female

Activity categories	1971		1981	
	Graduate and above	Secondary but below graduate	Graduate and above	Secondary but below graduate
Engaged in activities with productivity increase potentials	33.38	15.58	33.36	15.58
Studies	6.98	24.71	4.95	20.17
Others	59.64	59.71	61.69	64.25
TOTAL	100	100	100	100

Table 29 : Showing the activity-wise relative distribution of educated persons in the years of 1971 and 1981

All India : Persons

Activity categories	1971		1981	
	Graduate and above	Secondary but below graduate	Graduate and above	Secondary but below graduate
Engaged in activities with productivity increase potentials	68.55	53.77	66.35	53.88
Studies	5.73	22.90	4.57	19.13
Others	25.72	23.23	29.08	26.99
TOTAL	100	100	100	100

levels under consideration are also acquired by individuals above the age of 15 years. Further refinements in this area could also be done, but has been avoided in this paper as merely the dimensions are important for drawing relevant conclusions. On the supply side, beside the figure for percentage of graduates in the population, another percentage figure excluding the students from the stock of graduates has also been worked out. The latter co-efficient measures the proportion of available graduates in the population. Some thing has also been done in respect of the educational level of secondary but below graduate.

It is noted from the table that the figures for male graduates employed in the knowledge sensitive activities as per cent of total males employed in those activities has been less than the figures for the male graduates as per cent of male population above 15 years of age for both years of 1971 and 1981. The order does not change when the availability-based co-efficient is used in place of the latter. This means that the society has not only been indifferent about the graduation level of education but also has been biased against the use of graduates in knowledge sensitive activities. The position has been similar for males with secondary level of education. If the entire stock of secondary level educated persons in the population is considered, the bias against them in the matter of employment in the knowledge sensitive activities is seen as remarkable. The bias reduces considerably with the adjustment for student; but it will remain a moot point whether enrolment in the colleges for graduation level of general education will be held on by most if offer of employment becomes available. As it is, many persons go in for graduation level of education because in public jobs completed graduation level of education is specified as a minimum requirement, though jobs now being offered to graduates were given earlier to individuals with completed secondary level of education.

The position in respect of females was different. In both the years of 1971 and 1981 bias in favour of employment of graduate females in knowledge sensitive activities existed. A bias in this direction is seen also in respect of completed secondary level education for the year of 1971 when the student adjusted figure in the supply side is considered. But the pattern was different for the year of 1981 in respect of secondary level education. A bias against employment of females with secondary level of education in the knowledge sensitive activities appears in that year.

The findings are crucial. The proportion of highly educated persons in the knowledge sensitive activities is very small by any measure; but more importantly, this proportion could increase even if the society were utterly indifferent about the educational achievement of the individuals while offering employment. The immediate implication of this structure of bias has been that the socially induced rate of growth of supply of educated persons and the rate of growth of absorption of educated persons in the knowledge sensitive activities have become unrelated in the country. The result has been that most increases in the availability of educated persons have gone to swell the proportion of educated persons in knowledge insensitive activities and among unemployed population. This aspect is evidenced in the education-activity distribution of the population for the years of 1981 and 1971 presented earlier. Another result of this feature has been an increase of the proportion of persons in knowledge insensitive activities among the educated persons.

The bias referred above is statistical; and its absence in the choice under consideration reflects merely that the society has been indifferent as regards the educational qualification of the individuals while offering employment. Thus a nil bias itself is bad; for, it indicates irrelevance of education in the matter of occupational duties. But a negative bias, as has been evidenced in the data, should have altogether different implications. It would mean society even discriminates against educated persons in the matter of employment. It would be justifiable only if emoluments payable to the educated persons are more than what their contributions could be.

Highly educated persons in the above tables have covered levels of education of graduation and above and secondary but below graduation. There cannot be, however, any doubt about the fact that input of education and knowledge and the productivity of some activities are positively associated and that such activities necessarily prefer individuals with higher levels of knowledge and education to others. The reason why this has not happened in India during this decade, therefore, has to be traced to the nature of knowledge contained in the courses of higher education provided in India. The point is that the situation described above is consistent only with a condition that the content of education provided in the higher educational courses in India has not been consistent with the requirements of that segment of the economy which uses knowledge/skill input for productivity improvement.

In the section on Manpower Development in this paper distribution of enrolments by the areas of study has been presented. The educational programme in India has emphasized till now on the general and liberal forms of education leading to graduation and post-graduation degrees in Science, Arts or Commerce. About 90 per cent of the total enrolment in the schools and colleges have been in this form of education. In the stock of educated manpower also (graduate and above) the proportion of Arts, Science and Commerce degree holder form about 90 per cent of the total. It is, therefore, reasonable to conclude that this line of manpower development has been utterly inconsistent with the requirements of the time. One can look at the issue from the side of utilisation of the persons with secondary and graduation level of general education. The point for checking is whether these individuals, after employment in the knowledge sensitive activities were required to use the types of knowledge obtained in the regular educational

programme. Relevant data available in this regard are the distribution of employed individuals by types of education and by the occupation of their employment. Such data are available primarily from the Population Census and DGET sources.

Data are available for early years of the previous decade, but these are quite revealing. One observes from the data that a very large fraction of the persons with secondary level of education is employed as craftsmen and operatives. There can be doubt that for conduct of these jobs the individuals with secondary level of education had to obtain separate training, and also that, their employment depended on these trainings than on the education acquired in the secondary schools. For the category of graduates also one observes that a large fraction is employed as craftsmen, operatives and technicians. For employment in these occupations also individuals required separate training.

Most importantly, one also observes from the data that the workers with secondary level of education as per cent of total workers in the occupations of craftsmen and operatives is inordinately small. The enrolment in courses linked with these occupations being also very small, most persons employed in these occupations have to depend only on knowledge acquired on the job. This means that as regards allocation of individuals in different lines of education and training there is a positive case for reducing emphasis on general secondary education and for increasing emphasis on technical/professional education at the secondary level. A similar conclusion is reached in respect of post secondary education also from the data presented above.

The manpower issues for the decade of seventies, therefore, bear primarily on the pattern of manpower development followed in this country. The data positively indicate an inconsistency between supply and requirements.

Section V : Manpower Issues for the Nineties

Population accounts for different educational categories have not been prepared for the year of 1991 on the lines of 1981. In the earlier section a variety of co-efficients for the years of 1971 and 1981 have been presented. These have been worked out from the population accounts of those two years. The manpower issues have been framed on the basis of these co-efficients. For the study of the manpower issues for the nineties also the values of these co-efficients are needed. Therefore, instead of building up elaborate manpower accounts for the year of 1991, these co-efficients have only been projected for the year of 1991.

There are three crucial co-efficients for the understanding of the issues. These are (1) proportion of persons with a given education in the total population above the age of 15 years, (2) proportion of person of a given education available for employment in the population above the age of 15 years, and (3) the proportion of persons with a given level of education in the total number of persons employed in the knowledge sensitive activities. As the focus of this paper is an investigation of the manpower issues liable to be faced if the society progresses in the same way as it progressed in the past, it has been assumed that the co-efficients (1) and (3) would change in the same way as it did during the past period of 1971-1981. Appropriate changes in the proportions of students in the stock of persons with a given level of education, depending upon the behaviour in the past, have been made. The value of the co-efficient number (2) has been worked out using the figures for students thus arrived.

A few aspects of the pattern observed for the previous decade needs highlighting. If there is no statistical bias in the choice of a worker from the eligible population regarding the educational qualification of the individuals, i.e., if the employers are indifferent to the education of the individuals while offering job then the per cent of workers with a given education in the total workers and the per cent of persons with that education in the total eligible population will be equal. Incidentally, for the year of 1971, for the male graduates, the former percentage value was less than the latter value. The order of the values does not change when the students are excluded from the numerator while calculating the second percentage figure. As such, therefore, there was a bias against the male graduate in the matter of employment in 1971. It is observed from the figures relating to the year of 1981 that the ratio of these two co-efficients remained the same as the ratio pertinent to the year of 1971. It means that the nature of bias did not change during the decade. This pattern has been preserved in the projection of the co-efficients for the year of 1991. In respect of the females, a bias in favour of the graduates was observed in the data for 1971. The magnitude of the bias, however, decreased during the decade; and the two co-efficients mentioned above moved closer to each other in the year of 1981. In the projection of co-efficients in respect of the females this trend has been preserved. Six tables (Table 30, Table 31, Table 32, Table 33, Table 34, Table 35) showing the values of the co-efficients for the years of 1971, 1981 and 1991 separately for all persons, males and females and for the educational levels of graduate and above, and secondary but below graduation are presented below.

As in the projection for the year of 1991 the pattern observed in the decade of 1971-1981 has been preserved, nothing additionally requires to be said about the supply and requirements of educated persons. The probability that the pattern shall not change is also reasonably high. The proportion of enrolment in the general educational courses increased during the previous decade; and there has occurred no change as yet in the policy direction to warrant a shift in this behaviour. Therefore, contrarily, in all probability, the situation would worsen further than what has been visualised in the projection.

Table 30 : Values in percentages of significant co-efficients for 1971, 1981 and 1991 (Graduate and above)

All India : Male

Name of the co-efficients	1971	1981	1991
1. Proportion of graduates and above in the population above the age of 15 years	1.61	2.91	5.26
2. Proportion of available graduates and above in the population above the age of 15 years	1.52	2.78	5.08
3. Proportion of workers with graduate and above levels of education in the total worker	1.45	2.70	5.03
4. Proportion of workers in the total graduate and above population	77.28	77.29	77.30
5. Proportion of students in the total graduate and above population	5.43	4.45	3.65
6. Proportion of others in the total graduate and above population	17.29	18.26	12.05

Table 31 : Values in percentages of significant co-efficients for 1971, 1981 and 1991 (Graduate and above)

All India : Female

Name of the co-efficients	1971	1981	1991
1. Proportions of graduates and above in the population above the age of 15 years	0.43	1.04	2.52
2. Proportion of available graduates and above in the population above the age of 15 years	0.40	0.99	2.45
3. Proportion of workers with graduate and above levels of education in the total worker	0.77	1.55	3.12
4. Proportion of workers in the total graduate and above population	33.38	33.36	33.34
5. Proportion of students in the total graduate and above population	6.98	4.95	3.51
6. Proportion of others in the total graduate and above population	59.64	61.69	63.15

Table 32 : Values in percentages of significant co-efficients for 1971, 1981 and 1991 (Graduate and above)

All India : Persons

Name of the co-efficients	1971	1981	1991
1. Proportion of graduates and above in the population above the age of 15 years	1.04	2.01	3.88
2. Poportion of available graduates and above in the population above the age of 15 years	0.98	1.91	3.72
3. Proportion of workers with graduate and above levels of education in the total workers	1.34	2.47	4.55
4. Proportion of workers in the total graduate and above population	68.55	66.35	64.22
5. Proportion of students in the total graduate and above population	5.73	4.57	3.65
6. Proportion of others in the total graduate and above population	25.72	29.08	32.13

Table 33 : Values in percentages of significant co-efficients for 1971, 1981 and 1991 (Secondary level of education)

All India : Male

Name of the co-efficients	1971	1981	1991
1. Proportion of graduate and above in the population above the age of 15 years	7.07	10.74	16.32
2. Proportion of available graduates and above in the population above the age of 15 years	5.48	8.73	13.91
3. Proportion of workers with graduate and above levels of education in the total worker	5.22	8.52	13.91
4. Proportion of workers in the total graduate and above population	63.12	66.00	69.01
5. Proportion of students in the total graduate and above population	22.46	18.80	15.74
6. Proportion of others in the total graduate and above population	14.42	15.20	15.25

Table 34 : Values in percentages of significant co-efficients for 1971, 1981 and 1991 (Secondary level of education)

All India : Female

Name of the co-efficients	1971	1981	1991
1. Proportion of graduate and above in the population above the age of 15 years	1.87	3.65	7.12
2. Proportion of available graduates and above in the population above the age of 15 years	1.41	2.92	6.04
3. Proportion of workers with graduate and above levels of education in the total worker	1.56	2.55	4.17
4. Proportion of workers in the total graduate and above population	15.58	15.58	15.58
5. Proportion of students in the total graduate and above population	24.71	20.17	16.46
6. Proportion of others in the total graduate and above population	59.71	64.25	67.96

Table 35 : Values in percentages of significant co-officients for 1971, 1981 and 1991 (Secondary level of education)

All India : Persons

Name of the co-efficients	1971	1981	1991
1. Proportion of graduates and above in the population above the age of 15 years	4.57	7.33	11.76
2. Proportion of available graduates and above in the population above the age of 15 years	3.53	5.93	9.96
3. Proportion of workers with graduate and above levels of education in the total worker	4.60	7.33	11.68
4. Proportion of workers in the total graduate and above population	53.77	53.88	53.99
5. Proportion of students in the total graduate and above population	22.90	19.13	15.98
6. Proportion of others in the total graduate and above population	23.33	26.99	30.03

The above issues will, however, show up in a different dimension in the nineties. It will be seen from the tables that in the decade of 1971—81, while bias against the employment of females with secondary but graduation level of education operated all through in respect of female graduates there was a small bias in their favour. The extent of favourable bias decreased during the decade leading to the conclusion in the table that in the nineties the bias will be withdrawn altogether.

As such also, the proportion of educated female in knowledge insensitive activities is remarkably high. For both educational levels, about 60 per cent were in such activities in 1971. In 1981, the figure increased to 64 per cent for the females with secondary level of education and to 62 per cent for the other group of females. For the secondary level of education category the figure is expected to rise to about 68 per cent in the year of 1991; and that for the other categories to about 63 per cent. The figures in respect of the secondary level education would be much higher but for the significant rate of enrolment for further education.

Another feature of this issue will show up at the aggregative level in the nineties. The per cent of educated persons absorbed in knowledge sensitive activities, separately for males and females, and also separately for both levels of education remained constant during the previous decade. But at the level of all persons, the percentage figure for each educational level decreased in 1981 relatively to the figure for 1971. This occurred because the proportion of females in the total educated persons increased during this period. With a trend in this direction preserved, the per cent of educated persons in knowledge sensitive activities will decrease further in the nineties.

Conclusion

India's major manpower problem lies in extreme generalities. The per capita income at constant prices increased during the last thirty years at the rate of one and a half to two per cent per year. The rate of saving during this period increased from about seven per cent to more than twenty per cent, bringing forth growth rates of capital higher than the growth rate of domestic product. The growth of educated manpower also occurred at a rate much higher than the growth of population, leading to steady increase in the proportion of educated manpower in the population. These figures together bear no relationship; whereas by all consideration, theoretical and empirical, there should have been one. This absence of relationship, where there should have been one is the basic manpower problem for this society.

The problem is enormous; for, on the surface, the society has strong grounds for expecting, in keeping with the rapid growth of human and physical capital formation, much higher rate of growth of the economy than what was realized. The gap between the expectation and the realization was also so large that it would be naive to believe that the problem merely lay in maladjustment of demand and supply of this or that category of manpower.

Thus for searching the manpower issues for the nineties, a thorough investigation of the pattern of growth, development and utilisation of population and manpower was undertaken in this paper. The problem surfaced turned out structural and endemic, spreading out in various forms. The paper brings out some of the forms in which the problem will surface in the nineties. The problem will in any case live on unless remedied drastically.

In a nutshell, the problem is that the areas emphasized in our educational programme and the knowledge needed for our knowledge sensitive socio-economic activities have no relationship with each other. The dichotomy is total: more than 90 per cent of the enrolment for higher education is in the liberal and general educational lines of science, arts and commerce, whereas in the choice for employment in the knowledge

sensitive activities the employers are utterly indifferent in regard to this form of education. In respect of the males with this form of education the study brings out evidence also of definite bias against them in the matter of employment in these activities. The study further brings out that by the middle of nineties similar bias will begin operating against the females with this form of education, making the present form of education totally irrelevant for the society at that stage.

In one regard this conclusion immediately provides meaning to the figures mentioned in the first paragraph. With irrelevant education, effective human capital formation has been nil so that the entire growth in per capita income would be ascribed to increase of physical capital per unit of labour. There also being grounds for believing that in such situations marginal productivity of capital decreases, slow economic growth and rising capital-output ratio would be naturally expected.

In another sense also the above conclusion is strongly founded. The Indian economy is basically traditional in that the agriculture, and household and small proprietory based economic activities still predominate. These activities not only employ a very large proportion of labour but also produce a considerable portion of the national income. Thus, the development in this society has to depend on development of this traditional segment of the economy. The elitist and liberal education provided in the Indian universities on the other hand caters, at the most, to the needs of a microscopic segment of the economy, which is ultramodern and is utterly negligent of the needs of the traditional sector. The traditional sector is also knowledge and skill sensitive, but the variety it requires and the variety the education system provides are different. Thus on the one hand, there is an utter shortage of appropriate skill and knowledge forcing the establishments depend on knowledge gained only on the job and on the other a glut of inappropriate skill and knowledge exists leading to overt and covert unemployment among the so called educated persons. This is the manpower problem for this society; and this problem will continue to be there so long as this emphasis on elitist liberal education remains in this country.

PAPERS OF SESSION V

A PERSPECTIVE ON INTERGENERATIONAL CHANGE IN PAKISTAN: EDUCATIONAL ATTAINMENT AND MARRIAGE TIMING

PETER SMITH, SABINA S. SYED AND MEHTAB S. KARIM

I. Introduction[1]

Pakistan is now at the beginning of its demographic transition. Mortality has begun to decline, though the fertility level remains high (Alam and Shah 1982), held below the biological maximum only by what have come to be called "supply" factors—especially health and nutrition-related impairments to fecundity—rather than by deliberate fertility control. Many forces contribute to the continuing high fertility level in Pakistan, not the least being a very early age at marriage which permits an exceptionally early start on childbearing for most women (Karim 1980). In addition, uncertainties regarding infant and child mortality motivate the continuation of reproduction until late in the childbearing years.

The general outlines of the demographic picture in Pakistan are clear, but it is difficult to gain a more precise image because the available data are so limited in scope and the problems of measurement so severe. In this report we strive to introduce some perspective and depth to our picture of the fertility transition in Pakistan by relating that historical transformation explicitly to changes in the system of family formation. We employ a new data set, the Asian Marriage Survey (AMS), which was designed specially for illuminating relationships among fertility changes, systemic changes in the family, and broader social and economic transformations.

Demographers are accustomed to describing change in cross-sectional or "period" terms—in the language of birth, death and other rates during calendar segments of time. Thus, for many developing countries the 1950s was a period of rapid mortality decline and the 1970s a period during which fertility decline was initiated. But in the analysis that follows the usual historical or period demographic changes are recast in generational terms—into the social framework in which change is experienced by individuals within families.[2]

A. *The Asian Marriage Survey*

The AMS round for Pakistan was conducted as part of an international effort to obtain detailed and comparable data on changing family systems in a range of Asian societies. The AMS thus far covers Indonesia, the Philippines, and Thailand as well as Pakistan, and a Sri Lanka round is nearing completion.[3]

The survey was conceived and planned by a group of researchers from Asia, the Pacific, and the United States during workshops conducted at the East-West Center in Honolulu, at the University of the Phillippines Population Institute in Manila, and at Mahidol University's Institute of Population and Social Research. Other reports on the survey will describe the study design in detail. Our comments here are limited to a brief summary of the AMS "core" and Pakistan round questionnaires and a statement of how the samples were drawn.

The AMS obtained data from married couples on their marriage and family formation patterns as well as on significant social and economic events in each individual's life course. In each country, samples of households were drawn to represent three distinct socio-economic groups defined a priori. Each of the country surveys included a rural sample of between 400 and 600 households from one or a few contiguous villages, a similar-sized urban lower class or "squatter" sample drawn from a small number of squatter-dominated urban neighbourhoods in a major city, and a similar-sized urban middle class sample of households taken from a few city neighbourhoods of a more prosperous but not wealthy character in the same city.

In each country, the numerically dominant linguistic or religious group was sought. Cultural homogeneity within the samples for each country was desired so that detailed cultural factors—such as inheritance and dowry systems, attitudes about proper roles for men and women, the details of courtship and marriage and the like—could be assessed within a unified cultural milieu. Each of the three strata—Rural, Urban-Low and Urban-Middle[4]—are relatively homogeneous in terms of economic background and current standard of living. Thus, within each country the AMS study design allows for comparisons among strata that differ socio-economically but are similar culturally. Cross-country comparisons also can be made among strata that differ culturally but are at least somewhat similar in socio-economic terms. The urban areas surveyed are, respectively, Samarang, in north central Java, Lahore in the Punjab province of Pakistan, Manila in the Luzon region of the Philippines, and Bangkok in central Thailand. Corresponding village samples were drawn in localities 60 to 250 kilometres from each of these cities but within the same cultural/linguistic area. The samples represent Javanese Muslims, Punjabi Muslims, Tagalog Malay Christians, and Central Thai Buddhists.

The AMS questionnaires were administered to ever-married women aged 15 to 45 and to a subsample of their husbands, when living in the household, and covered a broad range of basic social and economic characteristics. In addition, special effort was devoted to collecting data from each of the spouses on the characteristics of their parents, the process of entry

42—5 RGI/ND/84

to marriage (including resource transfers directly associated with marriage), work and income, attitudes toward marriage and divorce, aspirations for children, and so on. Complete life histories were collected, including all events in the areas of education, work, migration, marriage, childbearing, and family limitation. Finally, women were asked for complete rosters of their siblings; for each sibling reported, these rosters include age, sex, age at marriage, years of schooling, current marital status and current occupation.

The Pakistan samples were drawn from the culturally homogeneous province of Punjab, an area which strongly reflects Muslim customs and culture. The provincial capital city of Lahore provided the two urban samples and a small number of villages in two adjoining districts provided the rural sample. A multi-staged, clustered, sampling design was utilized in both the urban and rural areas. The urban clusters or first stage sampling units were specially created enumeration blocks (EBs) while the villages or "mouzas" constituted the rural clusters. The samples were drawn from a total of 20 enumeration blocks in the urban area and from 10 villages in the rural districts of Kasur and Sheikhupura. Table 1 provides descriptive statistics for each of the sample strata. In general, the patterns of household size and composition and the relationship to head distributions are typical of household surveys in Pakistan. Household size is very high, especially in the urban strata where nearly two persons other than spouses or children were enumerated per household. A very high percentage of household members are children of the household head or under age 15.

Certain shortcomings as well as strengths of the survey should be emphasized. The survey does not offer refined measures of fertility representing the entire population of Pakistan. And, the sample sizes within strata preclude detailed tabulations involving many categories and controls. On the other hand, heretofore unexamined relationships between social and family changes can be examined within each of the three sample strata, and comparisons can be made among the strata. A notable strength of the AMS is the generational depth it provides. Comparisons can be made between parental and offspring generations, and sometimes across three generations including respondents' offspring.

B. *Preliminary Analysis*

As a first look at a complex data set which has not yet been fully formatted for analysis, the exposition in this paper is somewhat discursive in nature. Before moving to the analysis, we want to illustrate the manner in which our data, presented in generational terms, are used here to capture important aspects of social change related to the family. To do this we focus on the data collected in the AMS regarding schooling.

The schooling transition has been a less dominant social force in Pakistan than in many other Asian countries (Shah 1982; Smith and Karim 1980). Still, dramatic intergenerational changes are evident in the AMS results. Table 2 offers comparisons among the three sample strata and, within each of them, between two broad cohorts of women. To avoid selectivity problems resulting from the age and marital status criteria for inclusion in the samples, respondents below certain age cut-offs have been excluded.[5] The format of Table 2, which recurs throughout this paper, highlights stratum differentials as well as cohort comparisons. With regard to schooling, the differences across strata in Table 2 are generally very substantial and reflect a host of socio-economic differences among the strata as well as schooling differences. The broad age groups that are shown differ by substantially less on the whole, but comparing them provides another window on the changes that are occurring.

Considering respondent's schooling levels first, both the stratum and age group comparisons indicate important changes, particularly in the two urban strata.[6] It should be noted that throughout this analysis we are contrasting the numerically dominant, very traditional, rural sector of the population of Pakistan to a very small, urban elite. The very high level of schooling in our Urban-Middle stratum reflects its elite status. For the present purpose the contrast is useful, provided we remember that only a small fraction of the Pakistani population is represented by our Urban-Middle stratum.

Historical change is indicated more directly by a comparison of mothers' and daughters' educational attainments. All respondent groups exceed their mother educational levels in average terms, the Rural groups only negligibly so but the Urban-Middle group by more than five years. Another interesting comparison is between respondents and their spouses. Husbands on average have two to four more years of schooling than their wives. The difference diminishes among younger wives in the two urban strata but is greater among younger Rural wives.

Similar patterns are indicated by the data on whether individuals ever attended school and on literacy. These latter indexes are especially useful given the very low levels of schooling in Pakistan. It should be noted that there is a broad correspondence between these patterns and the growing and then declining sex differential in literacy seen in the series of Pakistan national censuses (Shah 1982).[8]

Other observations might be made, but our purpose here is only to emphasize the utility of generational comparisons on this and many other social dimensions. Later in this paper we will relate these mother-daughter generational differences in schooling to mother-daughter differences in marriage timing.

Each generation's own levels on socio-economic characteristics such as schooling can, of course, influence its own marriage and fertility patterns, and such influences are at the core of most conventional analysis of fertility determinants. However, intergenerational influences may exist as well (Ben-Porath 1975; Duncan et al. 1975). The statuses of offspring on dimensions such as schooling have been shown

to be determined in part by the statuses of their parents (Sewell and Hauser 1977), and through this intergenerational transmission of statuses parental characteristics can indirectly influence children's behaviour. More directly, both parental characteristics and their demographic behaviour can be influential in the socialization of offspring to values and intentions regarding economic achievement (e.g. Rosen 1982) and such behaviour as early vs. late marriage and the bearing of many vs. fewer children. The Asian Marriage Survey provides a few measures of parental attitudes and expectations concerning offspring as well as of offspring behaviour that can be related to parental socio-economic characteristics including their marriage and fertility behaviour.

Another kind of important parental influence can best be described negatively. Social science models of intergenerational influences usually have been developed in low-mortality settings where nearly all parents survive into the adulthoods of their offspring (e.g., Blau and Duncan 1967, on the U.S.); thus, when parents and children are separated from one another in the developed countries this is usually due to divorce. The divorce rate is low in Pakistan (Karim and Alam 1982), but mortality has been high until quite recently; certainly it was high among the parents of those who were respondents in the Asian Marriage Survey.

The importance of this factor among Asian Marriage Survey respondents is evident in the data in Table 3. Respondents aged 30 and over reported on mothers who were, at the time of the interview—or, if deceased would have been—in their late fifties, and on fathers some five years older. Among the older Rural respondents more than half had lost their fathers to mortality, and two-fifths had lost their mothers. The two urban strata also report high levels, though lower than among the Rural respondents.[9] Even the younger group of respondents report substantial parental mortality, ranging from 12 to 22 per cent.

Given our interest in assessing parental influences early in lives of offspring, we are interested in the probabilities of parents surviving to the important life cycle events of their children. Table 3 provides two illustrative measures: the percentages of respondents who were living with both parents when aged 10 and at the time of marriage. (Note that both parents are considered, and that mortality as well as other reasons for not living with parents are reflected.) We find that the majority of respondents were still living with both parents at age 10, but that a substantial minority—10 to 15 per cent in most strata—were not.[10] By the time of marriage—around ages 17 to 20 in these samples—some 20 per cent of the urban respondents and an even higher percentage of Rural respondents were not living with both parents. We also note small but uniform improvement among the younger respondents.[11]

Two implications of these patterns of parental mortality should be highlighted. First, any examination of parental influences on children must take into account parental survival and co-residence with offspring.[12] Second, in examining parental-generation fertility levels, parental mortality must be considered. We will see below that where low fertility is reported in the parental generation it is typically accounted for by parental mortality.

II. Continuities and Changes in Marriage and Fertility

A. *Age at Marriage*

The respondent generation in the Asian Marriage Survey is characterised by negligible age at marriage differences between age groups but very considerable differences across strata (Table 4). Rural respondents married at about age 17 on average, while Urban-Low women married more than one year later and Urban-Middle women nearly three years later.[13] Similar but much smaller stratum differences are reported for their mothers, for whom the mean age at marriage ranges from somewhat over 14 to somewhat over 16.

Within each stratum there is a very substantial mother-daughter shift in the mean timing of marriage —greatest, though perhaps diminishing more recently, in the Urban strata where the latest ages at marriage among mothers are found. Thus, we are led to the interesting conclusion that the very considerable stratum differentials found among our respondents have resulted from rapid intergenerational changes—however, these changes occurred mainly among women whose mothers had already begun to move toward a pattern of later marriage a generation earlier.

B. *Childbearing*

The Asian Marriage Survey provides several measures each for mothers' and respondents' fertility levels (Table 5), thus offering us some opportunity to validate our results by comparing these estimates for consistency. The younger and older cohorts of respondents are shown; within the latter, women with completed fertility are shown separately.[14] Our measures of parental fertility levels are reassuring in their overall consistency. Both mothers' and fathers' total children ever born were obtained in conjunction with complete marital histories for each parent in the form of sibling rosters provided by respondents. Since over 10 per cent of the fathers, but a smaller percentage of the mothers' reported that they had been married more than once, mothers' and fathers' children ever born are not always equal, and, of course, neither need be equal to the number of full biological siblings reported by a respondent. The fact that fathers' children ever born exceeds mothers' children ever born by a small margin probably reflects the greater prevalence of higher order marriages among men in Pakistan. The count of respondents' full siblings number fractionally fewer, as expected.[15]

Less readily understandable are the observed differences in fertility between parents of younger and older respondents. We had expected that parents of the younger respondents would have fewer children ever born reported for them—because their childbearing was more likely to be incomplete—whereas respondents aged 30 or older were likely to have mothers with completed childbearing. Instead, however, we find that parental fertility is highest among the younger respondents.

One possible interpretation is that the parental fertility levels for respondents below age 30 are essentially correct, or perhaps just slightly truncated, while the responses form respondents aged 30 and older suffer substantially from incomplete recall. We noted earlier that about half the respondents' fathers had died by the time of the interview, along with 30 to 40 per cent of their mothers. Parents who did not (jointly) survive may as a result have had fewer children. In addition, incomplete recall may well be a greater problem among respondents whose parents had not survived than among respondents whose parents had survived. Examining parental fertility indicators for those parents who had jointly survived (the third panel of Table 5), we are led to suggest that both parental mortality and poor recall among older respondents are sources of the observed differences between older and younger cohorts of respondents on parental fertility. In the Rural stratum, for example, mothers' children ever born for younger respondents exceeds that for older respondents by 6.8 per cent on average when all parents are considered, but by only 2.2 per cent among (jointly) surviving parents. In both cohorts, parental fertility among (jointly) surviving parents is generally higher than the fertility of all parents.

It is also possible that the observed pattern is due to historical improvements in fecundity among mothers —that is, that the slightly higher mothers' fertility reported among younger respondents is genuine. In this connection we also note the pattern of fertility levels by stratum which, on balance, is consistent with a history of rising and then (thus far only for the elite group) declining fertility over time. For example, fertility among mothers is highest in the Urban-Middle stratum, while in the respondent generation the lowest fertility is found in the Urban-Middle stratum. Also, respondents' fertility is below that of parents in the Urban-Middle, while in the other strata respondents' fertility exceeds that of parents.[16]

III. Prospects for the Next Generation

A. *Education*

The results presented in Table 2 above amply demonstrate that school attendance, literacy, and even years of education attained have begun to make advances in Pakistan. The data in Table 2 on progress actually achieved are complimented by attitudinal information from the AMS which offers a rare assessment of the importance people place on schooling and what the future may hold for the younger generation.

That respondents' aspirations for their own schooling were not fully realized in their early years is evident in Table 6. In the Rural stratum, one woman in ten reported that at the time she left school she had wanted to continue, and one in three now wishes in retrospect that she actually had done so. Even in the relatively well-educated Urban-Middle stratum, four of ten had wanted to continue and more than six of ten now wish that they had. These levels rise in the younger urban cohorts, though not in the Rural stratum.

The AMS respondents' educational aspirations for their children are remarkable albeit not wholly realistic—a point that they themselves realize. Rural respondents say they think their daughters will need about nine years of schooling in order to achieve a "satisfactory living," and they think their sons will need about 12 years. The urban respondents think 11 to 15 years will be necessary for their daughters, 12 to 16 years for their sons.[17] These numbers are remarkable in relation to the educational levels of respondents and certainly in relation to those of their mothers. Unfortunately, they are also remarkable when viewed against realistic prospects. The majority of respondents in all strata and age groups think these educational attainments, though "necessary," are for mainly economic reasons highly unlikely (data not shown). Still, some educational progress has been achieved, and more is in the offing. Although the years of education ultimately attained by the children of AMS respondents may not be dramatically higher than for their parents—only the passage of time will tell—we do have clear evidence in an AMS data that the "third" generation represented in our data exceeds its parents and grandparents very considerably in exposure to at least nominal amounts of schooling. Table 7 shows, for example, that 78 per cent of the daughters of Rural respondents had already spent at least two years in school. This figure can be compared with 12 per cent of the respondents themselves and a negligible percentage of the respondents' mothers.

B. *Age at Marriage*

There is no doubt that this revolution in women's exposure to formal schooling has encouraged later marriage for our AMS respondents than for their minimally educated mothers. Moreover, it seems a safe presumption that the even greater advances in schooling that have been achieved or are anticipated for the children of our respondents will push upward their ages at marriage as well.

In addition to this intergenerational transformation associated with the educational revolution, however, we have evidence in our data of another, more direct kind of influence of parental on offspring marriage patterns. Significant positive correlations between mothers' and daughters' ages at marriage (see Table 8) suggest that there are socialization or "role model" effects of mother's marriage behaviour on that of daughters. Late marrying mothers have late marrying daughters. This socialization effect is quite apart from the effects transmitted through education, since the correlations are significant even after appropriate statistical controls.

The facts just outlined strongly suggest substantially later entrance to marriage for the generation now in its youth. And, the AMS respondents are apparently aware of these processes. When they were asked for the ages at which they expected their male and female offspring to marry, their answers, for females at least,

complete a three generational sequence of changes in the marriage pattern (Table 9). The mean expected ages for daughters' marriage exceed mean respondents' ages at marriage by from one to two years.[18]

IV. Conclusion

These observations with regard to intergenerational changes in education and marriage timing raise important questions about the kinds of cultural and institutional change within families which surely must accompany the significant behavioural changes we have been describing. Other analysis of the AMS has led us to conclude that some changes in the attitudes and norms surrounding marriage are in evidence—but that there is less attitudinal change than might be expected on the basis on the observed behavioural changes.

Two decades ago, William Goode (1963) wrote of the ways that, in his view, the forces of "modernization" were affecting the family systems of developing nations. He suggested that such factors as free choice in marriage, abolition of dowry, and decline in parental authority over children, are inevitable consequences of industrialization and lead to changes in the family systems. He also observed that these patterns vary in detail as they interact with particular local and regional conditions and cultural traditions. Referring to Arab Muslim families he contends:

> "Although the leaders of Moslem life, and especially the educated middle class, have a clear vision of the alterations in family life.. .....the opinions and actions of the intellectual leaders are far ahead of ordinary customs, and the laws are far ahead of public opinion. (p. 163).

A decade later, Prothro and Diab (1974), wrote:

> "Changes in patterns of family life in the direction of greater freedom and equality for women and for youth can be expected to continue [and] Islamic culture will play an increasingly important, but distinctive role in the world wide evolution of family life."

Implicit in these common sense statements about Islamic societies are important propositions that do not as yet have adequate empirical support; for example, that "ordinary customs" will obey unstated laws of evolutionary social change and, eventually, mimic the present behaviour of the educated middle class; and, that freedom of choice, especially for women, lies at the heart of the changes in the family that are occurring.

The research reported in a preliminary fashion here is designed to clarify the interplay of Islamic culture, economic changes and the family institutions that influence fertility. We believe that an emphasis on change across generations can be effective as a means of relating macroeconomic and macrosocial changes to family institutions and, ultimately, to individuals.

---

[1]The data processing for this research was ably carried out by Tauseef Ahmed and Tom Fricke, East-West Population Institute Research Interns. Preliminary versions of this paper were presented at the Conference on Recent Population Trends in South Asia, New Delhi, India, Feb. 2—8, 1983 and the 1983 annual meeting of the Population Association of America, Pittsburg, Pennsylvania, USA, April 12—15.

[2]We cannot take the time here to elaborate on the concept of generations, but two points might be made in passing (see Troll and Bengston 1979). First, we are using the term to denote family lineage—the ascendent—descendent chain of grandparent-parent-child—rather than more loosely to indicate either individual developmental stages or age strata within a society. Second, many of the topics in family studies involving the generational perspective—e.g., the socialization of one generation by the preceding one, and problems in interpersonal relations spanning *vs.* within generations—are more complex analytically when family sizes are large and therefore offspring within a generation vary widely in age. The generational relationships reported here for Pakistan are especially interesting in light of the large family sizes and age-variances among siblings that prevail in this high-fertility population.

[3]The Indonesia round has been the responsibility of Dr. Peter F. McDonald, Australian National University, who has collaborated with Drs. Kasto of Gadjah Mada University, Jogjakarta. The Philippine round was carried out by Dr. Mercedes B. Concepcion and Josefina Cabigon of the Population Institute, University of the Philippines. The Thailand round was executed by Dr. Aphichat Chamratrithirong, Institute of Population and Social Research, Mahidol University. The Pakistan round was carried out by Dr. Sabina S. Syed through the Women's Division, Government of Pakistan and the All Pakistan Women's Association (AWPA). The Sri Lanka round, now in the field, is being conducted by Sirisena Gamage of the Department of Sociology, University of Perandeniya.

The Pakistan round of the AMS was funded under grant AID/pha—G—0048 from the U.S. Agency for International Development (USAID). The Indonesia, Philippines, and Thailand rounds were funded under USAID grant AID/pha—G—1202.

[4]Throughout this paper the capitalized lables "Rural," "Urban-Low," and "Urban-Middle" refer to these sample strata. The uncapitalized terms "rural" and "urban" are used conventionally.

[5]Selection and truncation biases are common in analysis of cross-sectional data (Ryder 1975). In the AMS the selection of ever married women means that young respondents are, of necessity, early marriers. To avoid this bias, we have excluded from analysis all respondent below age 21 in the Rural stratum and below ages 22 and 24 in the Urban-Low and Urban-Middle strata. These age cut-offs are those for each stratum by which some 90 per cent of all women who will marry have done so, as ascertained from available national level survey data (see Smith and Karim 1980).

[6]In comparison, national census data indicate a slight increase in the literacy rate between 1961 and 1973 for females aged 10 and over from 8 to 13 per cent. During the same period the percentage of females with a primary or higher level of education increased from 4 to 10 per cent (Shah, 1982). In 1973, wide differences between rural and urban areas were observed, however. Only 6 per cent of rural women were literate and 4 per cent had primary or higher levels of education. Urban women, on the other hand, had much higher levels, 32 and 26 per cent, respectively (Pakistan Census Organization, n.d.).

[7]Since mothers were identified in the survey through their daughters, the probability of a mother being identified in the survey is roughly proportional to the number of daughters she has borne. Thus, mothers with many children are overrepresented, and mothers' characteristics associated with large family sizes are also overrepresented. This may result in some downward bias in the estimates of mother'

schooling and age at marriage reported in this paper, though judging from the correlations between these and mother's children ever born (not shown) the effect is probably slight. However, the estimates of mean children ever born among mothers reported here are overestimates of the true means since they are contraharmonic (Bytheway, 1974).

[8]Data from other countries shown that the transition from low to high overall literary is generally associated with rising then falling sex differentials in literacy. On Asia, see Sundaram (1977) and Smith and Karim (1980).

[9]The very high level of mortality among fathers of Urban-Middle respondents may be anomalous, or may reflect the very great age gap between spouses in that stratum.

[10]The age and stratum differentials are worth noting. On average, 82 per cent of Rural women were living with both parents at age 10; only a slightly higher proportion of urban women reported this experience. Within the two age groups, however, differentials are more prominent. Over 94 per cent of the younger Urban-Middle women lived with both parents compared with 84 percent of younger Rural women. Among older women, however, the differentials are not as great (86 and 80 per cent, respectively).

[11]Thus, Rural women, especially older ones, even though they had married earlier than their counterparts, were more urban likely to be witnout two living parents at marriage.

[12]In subsequent analysis we will be looking into two related matters—the prevalence of substitute parentage, and patterns of support of younger by older siblings.

[13]Earlier studies show somewhat similar patterns of age at marriage in Pakistan. The 1975 Pakistan Fertility Survey(PFS), suggests an average age at marriage of about 17 years for younger rural women and about one year older for urban women. Within urban areas, however, women in the nigher socio-economic statuses married at about age 21 on average (Karim 1980). In a 1973 study conducted in the suburbs of Lahore (Afzal, Khan, and Chaudhry 1976) women were reported to have married at about age 19 on average. All ever married women were included in their calculations, however; this probably explains their lower estimated mean age at marriage.

[14]Defined as women of any parity who say they do not want to have another child

[15]Somewhat similar estimates of fertility are provided by two other sample surveys. The Pakistan Fertility Survey data (Sathar 1976 suggest an average of 5.8 children born to rural women ages 30—44 and 5.9 to their counterparts in urban areas. The Lahore suburban survey provides an estimate of 5.5 children ever born to women aged 30—44.

[16]Other studies report no significant rural-urban fertility differentials in Pakistan and, in fact, urban fertility is shown to be higher in two national sample surveys conducted in 1969 and 1975 (Yusuf and Retherford, 1981; Karim, 1974).

[17]Somewhat similar sex differentials in the perceived level of education were observed earlier (Shah, 1982). Data from the 1969 National Sample Survey suggest that while 89 per cent of urban women desired 10 or more years of schooling for boys, only 43 per cent desired that much for girls. Among rural women the corresponding percentages were even lower; 67 and 15 per cent respectively. Although a much higher level was desired by urban women with higher soci-oeconomic status, the wide sex differentials remained.

[18]There are no doubt some measurement problems with these responses since, for example, younger respondents say they expect less change than do older women. Still, it seems safe to conclude that a substantial amount of intergenerational change is expected.

Table 1 : Case Bases and Selected Characteristics of Households, by Stratum

Statistic	Stratum		
		Urban	
	Selected Rural Districts	Selected Poor Districts	Middle Income District (Gulberg)
1	2	3	4
Case Base (N)			
Households	350	445	195
Respondents	351	456	204
Husbands	331	428	195
Selected for Interview	198	270	120
Household Characteristics			
Average Household size	7.0	7.6	7.5
Percentage under age 15	46.9	43.0	38.0
Percentage ages 15—44	41.2	44.5	49.0
Percentage ages 45+	11.9	12.4	13.0
Relationships to household head (average nos.)			
Household heads	1.0	1.0	1.0
Spouses	1.0	0.9	1.0
Children	3.8	3.6	3.6
Others	1.2	1.9	1.8

Source: AMS, Pakistan

Table 2 : Indicators of Schooling and Literacy, by Stratum and Cohort of Respondent

Indicator	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income District (Gulberg)		
	All Ages	Under 30+	30+ Over	All Ages	Under 30+	30+ Over	All Ages	Under 30+	30+ Over
EDUCATIONAL ATTAINMENT (Years)									
Respondent	0.8	0.9	0.7	3.5	5.1	2.4	9.0	10.8	8.3
Respondent's Mother	0.1	0.1	0.0	0.7	1.2	0.4	3.5	4.7	3.1
Respondent's Father	0.9	0.7	1.1	2.8	3.3	2.3	8.5	9.0	8.3
Respondent's Spouse	3.8	4.5	3.3	6.7	8.0	5.8	12.6	12.8	12.5
Differences									
Respondent—Mother	0.7	0.8	0.7	2.8	3.9	2.0	5.4	6.1	5.2
Respondent's Father—Respondent's Mother	0.8	0.6	1.1	2.1	2.1	1.9	4.9	4.3	5.2
Respondent's Spouse—Respondent	3.0	3.6	2.6	3.2	2.9	3.4	3.5	2.0	4.2
EVER ATTENDED SCHOOL									
Respondent	0.12	0.13	0.12	0.44	0.61	0.32	0.33	0.04	0.78
Respondent's Mother	0.01	0.02	0.01	0.11	0.17	0.03	0.50	0.53	0.47
Respondent's Fahter	0.11	0.09	0.13	0.33	0.43	0.23	0.82	0.85	0.81
Respondent's Spouse	0.42	0.46	0.39	0.70	0.79	0.64	0.94	0.94	0.89
Differences									
Respondent—Mother	0.11	0.11	0.11	0.33	0.44	0.24	0.33	0.36	0.31
Respondent's Father—Respondent's Mother	0.10	0.07	0.12	0.22	0.23	0.20	0.32	0.27	0.34
Respondent's Spouse—Respondent	0.30	0.33	0.27	0.25	0.13	0.32	0.03	0.00	0.09
LITERACY (%)									
Respondent	0.11	0.12	0.10	0.43	0.59	0.32	0.84	0.90	0.82
Respondent's Motner	0.02	0.02	0.02	0.14	0.19	0.11	0.55	0.67	0.51
Respondent's Father	0.13	0.10	0.15	0.36	0.43	0.31	0.82	0.85	0.81
Differences									
Respondent—Mother	0.09	0.10	0.08	0.29	0.40	0.21	0.29	0.23	0.31
Father—Mother	0.11	0.08	0.13	0.22	0.24	0.20	0.27	0.18	0.30

Source: AMS, Pakistan.

Table 3: Indicators of Parental Mortality and Dissolution of the Parental Home, by Stratum and Cohort of Respondent

Indicator	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income District (Gulberg)		
	All Ages	Under 30+	30+ Over	All Ages	Under 30+	30+ Over	All Ages	Under 30+	30+ Over
Percentage with father deceased	39.5	21.6	53.9	37.0	23.6	46.1	44.8	15.4	56.5
Percentage with mother deceased	31.4	19.4	41.2	23.7	12.1	31.5	29.5	17.3	34.4
Percentage lived with both parents:									
At around age 10	81.6	83.6	80.0	88.2	89.2	87.5	88.5	94.2	86.3
At time of marriage	72.2	76.1	69.1	79.7	82.8	77.6	80.3	82.7	79.4

Source: AMS, Pakistan.

Table 4: Indicators of Generational Changes in the Age at Marriage, by Stratum and Cohort of Respondent

Indicator	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income District (Gulberg)		
	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over
Respondent	17.2	17.1	17.2	18.2	18.5	17.9	20.1	20.1	20.1
Respondent's mother . .	14.3	14.3	14.3	15.0	15.4	14.7	15.8	16.3	15.6
Respondent's spouse . . .	23.3	22.9	23.5	24.0	24.1	24.0	26.8	26.8	26.9
Respondent's advance over mother	2.9	2.8	2.8	3.2	2.9	3.2	4.3	3.8	4.5

Source: AMS, Pakistan.

Table 5 : Indicators of Fertility in the Parental Generation, by Stratum and Cohort of Respondent

Indicator	Selected Rural Districts				Selected Poor Districts		Middle Income District (Gulberg)					
			30 & Over				30 & Over				30 & Over	
	All Ages	Under 30	All	Completed Fertility*	All Ages	Under 30	All	Completed Fertility*	All Ages	Under 30	All	Completed Fertility*
Parental Generation (all)												
Mother's CEB	5.5	5.7	5.3	5.2	5.6	5.9	5.3	5.5	6.1	6.6	6.1	6.0
Father's CEB	5.7	5.8	5.5	5.5	5.7	5.9	5.5	5.6	6.5	6.3	6.4	6.3
No. in Sibling Set (No. Siblings+1)	5.5	5.7	5.3	5.3	5.5	5.8	5.3	5.4	6.1	6.3	6.0	6.0
Respondent's Generation												
Actual CEB	4.5	2.8	5.8	6.2	4.2	2.5	5.3	5.8	3.5	2.1	4.1	4.7
Expected CEB	4.8	4.3	5.6	5.9	4.2	3.9	4.6	5.0	3.7	3.3	4.1	5.5
(N)	(128)	(82)	(46)	(26)	(144)	(95)	(49)	(21)	(72)	(39)	(33)	(12)
Wanted CEB	4.4	3.9	4.8	4.7	4.0	3.7	4.1	4.1	3.4	3.1	3.6	3.6
Parental Generation (Joint Survivors to Respondent's Marriage)												
Mother's CEB	6.0	6.1	6.0	5.7	5.7	6.0	5.5	5.7	6.12	6.4	6.0	6.0
Father's CEB	6.1	6.2	6.1	5.9	5.8	6.0	5.7	5.8	6.4	6.5	6.3	6.3
No. in Sibling Set (No. Siblings+1)	6.0	6.1	5.9	5.7	5.7	6.0	5.5	5.6	6.0	6.4	5.9	5.9

*See footnote 14.

Source : Asian Marriage Survey.

Table 6 : Indicators of Schooling Attitudes by Stratum and Cohort of Respondent

Indicator	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income Districts (Gulberg)		
	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over
Respondent's Attitudes About Own Schooling									
Per cent Who Wanted to Continue in School*	11.0	10.4	11.5	23.6	33.1	17.2	40.4	44.2	38.9
Per cent Who Now Wish had More Schooling*	35.5	35.1	35.8	50.9	56.7	57.0	67.7	73.1	65.6
Generational Change in Mean Years of Schooling									
Mothers	0.0	0.1	0.0	0.9	1.2	0.4	3.6	4.7	3.1
Respondents	0.8	0.9	0.7	4.2	5.1	2.4	9.0	10.8	8.3
R's Daughters (needed)†	9.2	9.0	9.4	11.9	12.6	11.5	14.8	15.3	14.6
R's Sons (needed)†	12.5	12.1	12.8	14.2	14.6	14.0	16.4	16.4	16.4

*Asked of those whose reason for stopping school was not graduation or some other voluntary reason. The questions were "Otherwise, do you think you would have wanted to continue in school at that time?" and "Now, looking back, would you have wished some schooling or more schooling than you had?" Case bases all exceed 50.

†"In your opinion, what should be the least amount of education that children now a days need to make what you consider a satisfactory living?" (Separate responses for boys and girls). All case bases exceed 50.

Source: AMS Pakistan.

Table 7 : Changes Across Three Generations in the Percentage Completing Two or More Years of Schooling, by Stratum and Cohort of Respondent

Generation	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income District (Gulberg)		
	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over
Mother*	1.3	2.2	0.6	11.1	15.9	7.8	50.3	57.7	47.3
Respondent*	12.4	12.7	12.1	43.7	60.5	32.3	82.5	94.2	77.9
Female Children †	78.1	‡	74.4	89.5	‡	89.5	96.2	‡	97.1

*Based on years of schooling.

†Eastimated on basis of female children aged about 10 and older. Children's ages estimated from birth order and assumptions regarding birth intervals.

‡Fewer than 30 cases.

Table 8 : Indicators of Intergenerational Association between Age at Marriage and Fertility by Stratum, Respondents Aged 30 and Over

	Stratum		
		Urban	
	Selected Rural Districts	Selected Poor Districts	Middle Income District (Gulberg)
Between Mother's and Daughter's Age at Marriage			
Zero order	.304**	.221**	.140*
Controlling for father's and respondent's education and respondent's age	.291**	.164**	.107

*Significant at .01 level.

**Significant at .05 level.

Table 9 : Indicators of Expected Generational Changes in the Age at Marri gae byStratum and Cohort of Respondent

Indicator	Selected Rural Districts			Urban					
				Selected Poor Districts			Middle Income Districts (Gulberg)		
	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over	All Ages	Under 30	30 & Over
FEMALES									
Mother	14.3	14.3	14.3	15.0	15.4	14.7	15.6	16.3	15.6
Respondent	17.2	17.2	17.2	18.2	18.5	17.9	20.1	20.1	20.1
Daughters Expected	18.8	17.5	19.0	20.1	19,4	19.1	21.1	25.0	20.9
Age too Young	13.8	13.5	14.0	15.3	15.5	15.2	17.8	17.7	17.8
Age too Old	17.8	17.6	18.0	19.5	19.7	19.3	20.5	20.6	20.4
MALES									
Spouse	23.3	22.9	23.5	24.0	24.1	24.0	25.8	25.8	26.9
Sons Expected	23.2	22.3	23.2	25.4	24.7	25.4	26.7	27.7	26.7
Age too Young	17.2	16.9	17.5	19.1	19.1	19.1	21.9	21.5	22.2
Age too Old	22.6	22.2	22.9	24.6	24.6	24.7	26.3	26.4	26.2

Source: AMS, Pakistan.

References

Afzal, Mohammad; Zubeda Khan and Naseer A. Chaudhry. 1976—"Age at Marriage, Fertility, and Infant-Child Mortality in a Lahore Suburb. Part I." *Pakistan Development Review* 14(1) : 90-109.

Alam Iqbal and Nasra M. Shah 1982—"Population Composition, Mortality, and Fertility." In Nasra M. Shah (ed.) Pakistani Women : A Socio-economic and Demographic Profile. Honolulu: East-West Population Institute.

Ben-Porath, Yoram 1975—"First Generation Effects on Second Generation Fertility". *Demography* 12(3) : 397-405.

Berent, J. 1953—"Relationships Between Family Sizes of Two Successive Generations." *The Milbank Memorial Fund Quarterly* XXXI : 39-50.

Blau, Peter M. and Otis Dudley Duncan 1967—The American Occupational Structure, New York : John Wiley and Sons.

Bytheway, Bill 1974—"A Statistical Trap Associated with Family Size" *Journal of Biosocial Science* 6 : 67-72.

Duncan, Othis Dudley, Ronald Freedman, Jay Michael Coble, and Doris P. Schellenger 1965—"Marital Fertility and Size of Family of Orientation." *Demography* 2: 508-15.

Hendershot, Gerry E. 1969—"Familial Satisfaction and Fertility Values." *Journal of Marriage and the Family* 31: 27-33.

Johnson, Nan E. and C. Shannon Stokes 1976—"Family Size in Successive Generations : The Effects of Birth Order, Intergenerational Change in Lifestyle, and Familial Satisfaction." *Demography* 13(2) : 175-87.

Karim, Mehtab S. 1974—"Fertility Differentials by Family Type." *Pakistan Development Review* 13(2) : 129-144.

—1980 "Nuptiality in Pakistan : Trends and Determinants." Paper prepared for the World Fertility Survey Conference. London : July.

Karim, Mehtab S. and Iqbal Alam 1982—"Marriage Patterns, Marital Dissolution, and Remarriage." In Nasra M. Shah (ed). *Pakistani Women ; A. Socio-economic and Demographic Profile.* Honolulu : East-West Population Institute.

Pakistan Census Organisation nd.—*Housing, Economic, and Demographic Survey*—1973. Vol. II, Part I. Statistical Tables, Pakistan. Islamabad: Interior Division, Government of Pakistan.

Rosen, Bernard Carl 1982—The Industrial Connection: Achievement and the Family in Developing Societies. New York: Aldine Publishing Co.

Ryder, Norman 1975—"Fertility Measurement through Cross-Sectional Surveys." *Social Forces* 54(1): 7-35.

Sathar, Zeba Ayesha 1976—"Rural-Urban Fertility Differentials : 1975." Pakistan Development Review 18(3) : 231-51.

Sewell, William H. and Robert M. Hauser 1977—"On the Effects of Families and Family Structure on Achievement." In Paul Taubman (ed.) Kinometrics : Determinants of Socio-economic Success Within and Between Families. New York : North-Holland Publishing Company.

Shah, Nasra M. 1982—"Education: Level, Enrolment, Facilities, and Attitudes." In Nasra M. Shah (ed.) *Pakistani Women: A Socio-economic and Demographic Profile.* Honolulu : East-West Population Institute.

Smith, Peter C. and Mehtab S. Karim 1980—"Urbanization, Education, and Marriage Patterns: Four Cases from Asia." *Papers of the East-West Population Institute. No.* 7.

Stokes, C. Shannon and Nan E. Johnson 1977—"Birth Order, Size of Family of Orientation, and Desired Family size." *Journal of Individual Psychology*, (33) (1) : 42-46.

Sundaram, Chitra—"The Literary Transition and Female Nuptiality: Implications for the Status of Asian Women." Paper presented at the Eighth Summer Seminar in Population. Honolulu : East-West Center.

Troll, Lillian and Vern Bengston 1979—"Generations in the Family." pp. 127-161 in Wesley R. Burr *et al.* (eds.) Contemporary Theories About the Family : Vol. I. Research-Based Theories.

Yusuf, Farhat, and Robert D. Retherford 1981—"Urban Rural Fertility Differentials Estimated from the 1975 Pakistan Fertility Survey." Journal of Biosocial Sciences (13): 491-499.

DEMOGRAPHIC EVALUATION OF INDIA'S FAMILY PLANNING PROGRAMME

K. SIVASWAMY, SRIKANTAN AND K. BALASUBRAMANIAN

Introduction

India has the unique distinction of having been the first country to introduce an official programme for family planning in 1951 as an integral part of its socio-economic development plan. Since then the programme has grown steadily and today it is perhaps the second largest programme in the world covering a massive population of 68 crores. During its evolution, various strategies were developed for improving the performance of the programme.

When the Family Planning Programme was started in 1951, the approach was essentially clinical. The family planning services were made available in clinics on the expectation that people would visit them for getting advice and service. However, this approach failed to draw an adequate number of couples to the family planning clinics. Therefore, the programme strategy was changed from the clinical to the extension approach at the beginning of the Third Five Year Plan (1961-66). Unlike the clinical approach, the extension approach was meant to take the programme to the people by spreading the message and methods of family planning through an extensive network of primary health centres in rural areas, and hospitals and family welfare centres in urban areas.

The programme was strengthened in 1966 by the creation of a full-fledged Department of Family Planning in the Ministry of Health and Family Planning. Family planning services were integrated with those of health maternal and child care with the help of specially trained multipurpose workers. The Intra Uterine Device (IUD) was introduced during the period, but unfortunately without adequate preparation. After an initial period of encouraging response from the women during 1965 and 1966. IUD became unacceptable to a majority of women because of perceived side effects of the device that were unanticipated.

With the failure of IUD as an acceptable method of family planning, there was again a change in the programme strategy during 1969-74 with a shift in emphasis towards mass-camps for carrying out vasectomy operations. Although this approach received overwhelming response initially, it could not be continued for long for lack of sustained demand. Hence, mass-camps were replaced subsequently by mini-camps wherein only a few cases (between 20 and 25) were operated in order to ensure better follow-up care and to enhance acceptor satisfaction.

The next four years (1974-78) witnessed a drastic rise and fall in family planning acceptance. With the formulation of a National Population Policy for the first time in 1976 (Ministry of Health and Family Welfare 1976), that envisaged a series of fundamental measures to mount a direct assault on the problem of population, the programme performance reached a peak level during 1976-77. In the subsequent year, as a result of change in the national government, following the General Elections held in February 1977, the Family Planning Programme suffered a serious setback. However, by 1980 there was some recovery in the programme, with an increasing trend in the number of acceptors of various methods of family planning including sterilization.

An attempt is made in this paper to assess the demographic impact of the programme, especially in the recent period. The direct impact of the programme is in the spread of knowledge and increase in the use of family planning methods. By and large, by 1973 knowledge of family planning methods had attained the threshold level of social acceptability and had been disseminated successfully by the government to meet the needs of eligible women for such methods in both rural and urban areas (Srikantan, et al., 1982). Hence programme performance has to be evaluated in terms of family planning acceptance and prevalence rather than in terms of the levels of knowledge of methods.

A more direct assessment of the demographic impact from the trends in fertility is vitiated by two difficulties. For India, no reliable series of current fertility trends is available. The Sample Registration System provides perhaps the best estimates, but they too are subject to various limitations due to sampling and non-sampling errors. An additional source of evidence is the intercensal growth rate and indirect census based estimates of vital rates. Reconcilation of the estimates of fertility trends at State level from the different resolved satisfactorily so far.

A second difficulty in assessing the impact of the programme is that not all fertility decline can be ascribed to it. Changes in demographic factors such as age at marriage, proportion married and the age structure, and changes in social factors such as women's education, and status and roles can also lead to fertility decline. No attempt is made in this paper to assess the effect of social change on fertility.

The fertility impact of the programme is usually assessed from the cumulative number of acceptors or from the current prevalence of family planning by methods. In this paper, two measures, the percentage of couples protected against the risk of conception and the number of births averted in different years by various contraceptive methods are used for assessing the programme impact.

The main data source for this paper is the service statistics provided by the Family Planning Programme. Such data are systematically collected, compiled and published by the Ministry of Health and Family Welfare of the Government of India. In this paper, data are presented only for the sixteen major States of India, each of which had a population of over 50 lacs as on 1 March, 1981 according to the Census. But the figures for India relate to the entire population.

Performance of the Programme

As mentioned in the introductory section, the level of knowledge of family planning methods has already crossed the threshold of social acceptability and, therefore, it is adequate to evaluate the performance of the programme in terms of acceptance and prevalence of various contraceptive methods. The contraceptive methods provided by the programme are vasectomy, tubectomy, IUD, conventional contraceptives—condoms, diaphragms, jelly/cream and foam tablets—and oral pills. Besides, in institutions recognised by the Government for this purpose, induced abortion is available, free of charge, as "medical termination of pregnancy" (MTP).

Of all the methods of family planning, the actual emphasis of the programme falls on sterilization mainly because the number of annual acceptors of this method is far larger than for IUD, which also has a much lower method continuation rate. Besides, sterilization has a major share in the overall impact of the programme on fertility. The number of conventional contraceptive users relates to the prevalence of such use rather than to new acceptors. Hence the trends in annual achievements are mainly governed by the number of sterilizations.

Table 1 gives the acceptance of vasectomy, tubectomy, IUD, equivalent units of conventional contraceptive use (ECC) and equivalent sterilizations, for India from 1974-75 to 1980-81. The conventional contraceptives are converted into equivalent units of contraceptive use (ECC) by dividing the figures for condoms and foam tablets by 72, that for diaphragms by 2 and jelly/cream by 7. The divisors have been estimated as the average requirement for a couple to get complete protection against conception for a whole year by using the method. Based on continuation rates for IUD and ECC, the Department of Family Planning has worked out procedures for assessing the contributions of the different methods in terms of "equivalent sterilizations". As a rule of thumb, the number of IUDs inserted is to be divided by 3 and ECC users by 18 to obtain equivalent sterilizations for these two methods. It should be noted that the figures for ECC relate to the prevalence of these methods whereas for the other methods the figures are for annual additions.

The number of sterilizations done fluctuated from year to year. However, the overwhelming importance of sterilization in the programme is quite apparent from the data presented in Table 1. For instance, in 1974-75, 6.1 lac vasectomies and 7.4 lac tubectomies were done against 1.4 lac each of IUD insertions and ECC users in equivalent units of sterilization. With the 1974-75 figure as a base of 100, at the peak of the Emergency, in 1976-77, vasectomies went up to 1,016, tubectomies to 278, IUD's to 136, ECC's to 150 and the total number of equivalent sterilizations to 528, but the total number of acceptances went up to only 291 since number of ECC users showed only a marginal increase. Even in sterilization, the major thrust during the Emergency was on vasectomy which increased over nine-fold compared to 1974-75. Naturally the backlash in the following year was more severe on this method than on others. During the period of recovery a relative shift from vasectomy to tubectomy seems to have developed. In fact, in 1980-81, there were 4.3 lac vasectomies and 15.9 lac tubectomies performed, and in equivalent units of sterilization, 2.1 lacs each of IUD and ECC.

The number of institutions approved for MTP increased from 2,149 in 1976-77 to 3,294 in 1980-81 while the number of abortions done in these institutions increased from 2.8 lacs to 3.9 lacs and the MTP per 1000 eligible couples from 2.6 to 3.4 in this period (Ministry of Health and Family Welfare, 1982, p. 71).

The data presented in Table 2 bring out the uneven trends in performance among major States of India. The table presents the number of sterilizations for a normal year 1974-75, during the Emergency 1976-77, immediately thereafter in 1977-78 and more recently in 1980-81. With 1974-75 as a base figure of 100, during the Emergency year, the all-India sterilization achievement rose to 610 while that for Bihar rose to 2,147, Madhya Pradesh to 1,473, Rajasthan to 960, Uttar Pradesh to 1,643 and West Bengal to 1,577. In 1977-78, when the Emergency was revoked, again with 1974-75 as a base figure of 100, the all-India achievement declined to 70 while those for the above mentioned States declined to 109, 54, 34, 27 and 64 respectively. However, by 1980-81, the programme had fully recovered in those States and the number of sterilizations was nearly twice as much as for 1974-75.

One of the ways for measuring the prevalence of various methods of family planning is in terms of the percentage of couples currently and effectively protected against the risk of conception. Such an index has been computed by the Evaluation Directorate of the Ministry of Health and Family Welfare. The index for a year is calculated as percentage of the total number of eligible couples in mid-year, defined to be the number of currently married women, 15 to 44 years old, along with their husbands. The age distribution of wives of a cohort of one lac acceptor couples in a base year is used to calculate user attribution rate. This cohort is survived for six 5-year periods, until all the women of the cohort reach age 45, taking account of attribution due to the death of either spouse as well as the dissolution of the marriage. These calculations provide the survival rates for a cohort of acceptor couples.

As the method continuation rate for sterilization is assumed to be unity, the attribution rates are directly applied to the number of couples sterilized in a year to calculate the number of sterilized couples from the cohort surviving to future years. For IUD, the

Table 1 : Family Planning Acceptors by Year by Methods in India 1974-75 to 1980-81 Numbers in Lacs and Percentages to 1974-75 Figures

Year	Total Acceptors		Vasectomy		Tubectomy		Equivalent Sterilizations* IUD		Equivalent CC Users		Total equivalent sterilizations*	
	No. lacs	Percentage to 74-75	No. lacs	Percentage to 74-75	No. lacs	Percentage to 74-75	No. lacs	Percentage to 74-75	No. lacs	Percentage to 74-75	No. lacs	Percentage to 74-75
1974-75	43.1	100	6.1	100	7.4	100	1.4	100	1.4	100	16.4	100
1975-76	68.0	158	14.4	236	12.3	166	2.0	143	2.0	143	30.7	187
1976-77	125.3	291	62.0	1016	20.6	278	1.9	136	2.1	150	86.6	528
1977-78	45.3	105	1.9	31	7.6	103	1.1	79	1.8	129	12.4	76
1978-79	55.0	128	3.9	64	10.9	147	1.8	129	1.9	136	18.6	113
1979-80	54.8	127	4.7	77	13.1	177	2.1	150	1.7	121	21 6	132
1980-81	64.4	149	4.3	70	15.9	215	2.1	150	2.1	150	24.5	149

*Number of equivalent sterilizations is calculated as 1/3 the number of IUD insertions, 1/18 the number of equivalent CC users and 1/9 the number of equivalent oral pill users.

Source: Ministry of Health and Family Welfare (1982), pp. 59, 60.

Table 2 : Number of Sterilizations and Percentages to 1974-75 Figures by States for Selected Years, 1974-75, 1976-77, 1977-78 and 1980-81

States	No. of sterilizations in '000				Percentage to 1974-75 figures			
	1974-75	1976-77	1977-78	1980-81*	1974-75	1976-77	1977-78	1980-81*
Andhra Pradesh	132	760	139	233	100	576	105	176
Assam	39	226	14	24	100	579	36	61
Bihar	32	687	35	92	100	2147	109	287
Gujarat	155	317	112	201	100	204	72	130
Haryana	62	223	6	33	100	360	10	53
Jammu & Kashmir	5	18	6	11	100	360	120	220
Karnataka	62	430	94	143	100	693	152	231
Kerala	62	214	83	113	100	345	134	182
Madhya Pradesh	68	1002	37	130	100	1473	54	191
Maharashtra	238	862	118	312	100	362	50	131
Orissa	69	323	82	90	100	468	119	130
Punjab	36	140	13	48	100	389	36	133
Rajasthan	38	365	13	101	100	960	34	266
Tamil Nadu	198	567	112	131	100	286	57	66
Uttar Pradesh	51	838	14	79	100	1643	27	155
West Bengal	56	883	36	210	100	1577	64	375
INDIA	1354	8259	949	2029	100	610	70	150

*Provisional figures.

Source: Ministry of Health and Family Welfare (1979b), p. 77, (1980), p. 70 and (1982), p. 63.

number of couples, surviving the risks of mortality and marriage dissolution, is further subjected to attrition due to method discontinuation to obtain the number of couples using IUD in future years. The IUD continuation rate declines to zero in ten years.

The sum of all the surviving users from past cohorts of acceptors and the current acceptors in a year gives the number of couples currently and effectively protected by sterilization and by IUD. The number of current users of ECC are subject to an effectiveness rate of 50 per cent based on empirical studies (Department of Family Planning, 1979a).

The prevalence of various methods of family planning is shown in Table 3 from 1970-71 to 1980-81. The estimate used is the percentage of couples currently and effectively protected. The increasing predominance of sterilizations in family planning is clearly brought out by the figures for India. In 1970-71, 8.1 per cent of couples were protected by sterilization and only 2.5 per cent by other methods. By 1980-81, the couples protected by sterilization rose to 20.0 per cent while couples protected by other methods rose only slightly to 2.7 per cent. Since these are measures of prevalence, the increase for all methods was gradual over 1970-71 to 1975-76, from 10.6 to 17.2 per cent. During the Emergency year of 1976-77, however, this percentage steeply increased to 23.8. The programme suffered a set-back in the next three years and the percentage of protected couples declined to 22.3 by 1979-80. Thus, in these three years, there were not enough new family planning acceptors to replace the attrition due to spouse mortality, marriage dissolution and method discontinuation. However, the programme recovered by 1980-81 as the percentage of couples effectively protected showed a slight increase to 20.0 for sterilization from 19.9 in 1979-80 and to 2.7 from 2.4 for other methods in the preceding year. These figures, by and large, confirm the observations made earlier on the trend of the programme and the distorting effect of the Emergency.

In a country like India, with 76 per cent of rural population, higher fertility and natural increase rates in rural compared to urban areas, greater infra-structural and social barriers to spreading family planning use in rural areas, it is of crucial importance to estimate, separately for rural and urban areas, the prevalence of family planning. This has been done specially for this paper, using the Health Ministry's procedures for calculating the percentage of couples effectively protected in India and data from the programme service statistics and 1971 Census. The results are given in Table 3. In 1970-71, only 7.7 per cent rural couples were effectively protected by family planning methods against 22.5 per cent for urban couples. By 1980-81, 18.5 per cent rural couples and 40.5 per cent

Table 3 : Number of Eligible Couples and Percentage of Eligible Couples Effectively Protected by Various Methods of Family Planning from 1970-71 to 1980-81 for India and Rural and Urban Areas

Year	India				Rural				Urban			
	Estimated No. of eligible couples in lacs	Percentage effectively protected			Estimated No. of eligible couples in lacs	Percentage effectively protected			Estimated No. of eligible couples in lacs	Percentage effectively protected		
		1	2	3		1	2	3		1	2	3
1970-71	930	8.1	2.5	10.6	755	6.0	1.7	7.7	175	17.4	5.1	22.5
1971-72	953	9.9	2.5	12.4	774	7.4	1.9	9.3	179	23.3	5.6	25.9
1972-73	974	12.3	2.4	14.7	791	9.6	1.8	11.4	183	23.9	4.9	28.8
1973-74	996	12.4	2.5	14.9	809	9.6	2.0	11.6	187	24.2	4.8	29.0
1974-75	1019	12.8	2.2	15.0	827	9.9	1.8	11.7	192	25.1	24.2	29.3
1975-76	1042	14.4	2.8	17.2	846	11.3	2.4	13.7	195	27.7	4.6	32.3
1976-77	1062	20.9	2.9	23.8	865	17.4	2.4	19.8	200	36.0	4.5	40.4
1977-78	1089	20.2	2.4	22.6	884	16.7	2.0	18.7	205	35.4	3.9	39.3
1978-79	1114	19.9	2.5	22.4	904	16.4	2.1	18.5	209	35.1	4.3	39.4
1979-80	1139	19.9	2.4	22.3	925	16.4	1.8	18.2	214	34.9	4.7	39.6
1980-81*	1163	20.0	2.7	22.7	945	16.4	2.1	18.5	219	35.5	5.0	40.5

1. Sterilization; 2. I.U.D. and C.C. Users; 3. All methods.

*Provisional figures.

The rural and urban estimates were prepared by the authors.

Source: Ministry of Health and Family Welfare (1982), p. 85.

urban couples were protected by such methods. While the increase in the percentage of couples protected has been substantial in rural areas, it has been higher for urban areas. There are various programme infra-structural factors accounting for this. It is also seen that the relative protection offered by sterilization is more in rural than in urban areas. This is accounted for by such factors as the relative access to other methods of contraception, availability of stocks of these methods, use of contraception for spacing and education of women. The effect of the Emergency was proportionately stronger in urban than in rural areas. The percentage protected rose by about 8 per cent in urban areas against 6 per cent in rural areas. By 1980-81, the programme had recovered from the set-back after the Emergency in both the rural and urban areas.

Table 4 presents the data on percentages of couples effectively protected for sixteen major States of India for four selected years, 1974-75, 1976-77, 1977-78 and 1980-81.

By States, there was a wide variation in the percentage of couples effectively protected by all methods in 1974-75. Bihar, Jammu and Kashmir, Rajasthan and Uttar Pradesh were the four laggard States where the percentage of couples effectively protected was under 10 whereas Haryana, Maharashtra and Punjab had achieved a high level of performance with over 24 per cent of couples protected in that year. In terms of sterilization, Maharashtra had the highest percentage of couples protected of 23.6, followed by Tamil Nadu with 18.5 and Gujarat with 18.3. During the Emergency, an effort was made to improve the performance of the laggard States. But, as seen from Table 4, the Emergency appears to have had little lasting effect in bridging the gap. Although this percentage rose to 11.9 in Bihar, to 10.7 in Jammu and Kashmir, to 13.5 in Rajasthan and to 10.8 in Uttar Pradesh by 1980-81 the wide disparities among States remained. Gujarat and Maharashtra are the only two States where about one-third of the couples were effectively protected against conception in 1980-81.

Table 4 : Percentage of Couples Effectively Protected by State by Method for Selected Years 1974-75 1976-77, 1977-78 and 1980-81

State	1974-75				1976-77				1977-78				1980-81			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Andhra Pradesh	17.3	0.7	0.6	18.6	25.3	0.6	0.8	26.7	25.8	0.4	0.7	26.9	25.7	0.3	0.2	26.2
Assam	8.4	1.0	0.6	10.0	21.2	2.1	0.8	23.2	19.8	0.7	1.1	21.6	17.8	0.5	0.3	18.5
Bihar	5.9	0.7	0.2	6.8	12.9	0.7	0.5	14.0	12.2	0.3	0.5	13.0	11.3	0.3	0.3	11.9
Gujarat	18.3	1.1	2.1	21.5	25.0	1.3	2.5	28.9	25.0	1.1	2.3	29.3	30.2	1.3	1.8	33.3
Haryana	14.4	6.2	7.8	28.4	26.7	8.9	7.8	43.5	25.4	5.1	4.5	35.0	22.9	3.0	2.8	28.7
ammu & Kashmir	6.7	1.9	0.5	9.1	9.1	2.0	0.9	12.0	8.6	1.0	0.9	10.5	9.1	1.1	0.4	10.7
Karnataka	11.0	1.9	1.0	13.0	19.5	1.3	1.4	22.2	20.0	0.9	1.2	22.1	20.9	1.5	0.9	23.2
Kerala	18.4	2.4	0.8	21.6	26.4	2.1	1.8	30.3	27.0	1.2	1.2	29.3	29.7	1.0	0.3	30.9
Madhya Pradesh	11.4	1.4	0.9	13.7	22.8	1.2	0.9	24.9	21.2	0.6	0.9	22.7	20.3	0.5	0.5	21.3
Maharashtra	23.6	1.6	1.8	26.0	35.2	0.5	1.9	37.6	34.6	0.4	1.4	35.4	33.2	0.5	0.8	34.6
Orissa	14.6	2.5	0.6	17.7	23.1	2.0	0.7	25.8	22.9	1.0	0.7	24.6	24.3	0.8	0.4	25.4
Punjab	12.8	5.1	6.8	24.7	20.5	5.3	4.7	30.8	20.3	3.3	4.7	23.3	19.2	3.4	2.3	24.9
Rajasthan	5.8	1.1	0.8	7.7	13.3	1.0	1.0	15.3	12.2	0.5	1.1	13.8	12.1	0.6	0.8	13.5
Tamil Nadu	18.5	1.2	1.6	21.3	26.7	1.1	1.6	29.5	26.6	0.7	1.4	28.7	26.4	0.8	0.5	27.6
Uttar Pradesh	5.8	1·7	0.9	8.4	10.7	2.1	1.3	14.1	9.8	1.3	1.7	12.8	8.1	1.8	0·9	10.8
West Bengal	10.3	0.6	0.8	11.8	22.9	0.8	2.8	26.6	21.5	0.4	1.3	23.2	23.3	0.5	0.6	23.5
INDIA	12.4	1.4	2.5	16.3	21.1	1.5	1.8	24.4	20.4	0.9	1.5	22.8	20.0	1.0	1.7	22·7

1. Sterilization; 2. IUD; 3. C.C. Users; 4. All methods.

Source: Ministry of Health and Family Welfare (1975), p. 73, (1977), p. 93, (1978) p. 92, (1982) p. 86.

What is of equal importance is the differential performance of the programme in rural and urban areas in each State. The relevant data for each of the sixteen major States for the recent period 1980-81 are presented in Table 5. It is seen that over 20 per cent of the rural couples were protected by 1980-81 in Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab and West Bengal. Over 40 per cent of the urban couples were protected by 1980-81 in Andhra Pradesh, Assam, Haryana, Kerala, Maharashtra and Tamil Nadu. The urban bias of the programme, measured in terms of the ratio of urban to rural percentage couples protected, was 2.2 for India. This ratio was over 2.0 for Andhra Pradesh, Assam, Bihar, Haryana, Jammu and Kashmir, Kerala, Rajasthan and Tamil Nadu. While the urban bias by States was about the same magnitude for sterilization as for all methods, this bias was much more pronounced for IUD's and ECC users, since these methods were more readily available in urban areas. In a few States like Gujarat, Karnataka, Punjab and West Bengal, the family planning programme had already penetrated into the rural areas.

There are a number of reasons for the failure of the programme to penetrate into rural areas in most of the States of India. Pai Panandikar et al. (1981) attribute the differential performance by states to factors such as the socio-economic diversity within the country lack of commitment to the programme, inadequate health and transport infra-structure and inefficient management of the programme in some States, lack of local support in rural areas and unwillingness of family planning personnel to work in rural areas. The highly centralised programme, with standardised norms and procedures, and bureaucratic control does not allow sufficient flexibility for the effective adaptation of the programme to suit the local conditions prevailing in each State.

Data on socio-economic characteristics of family planning acceptors such as place of residence, religion, occupation and education are useful in identifying the segments of the population that accept or resist family planning methods. On the other hand, data on demographic characteristics like age and parity of acceptors are important for assessing the fertility impact of the programme. Since the major aim of the paper is the demographic evaluation of the Family Planning Programme, only the key demographic acceptor characteristics of age and parity are considered here.

From the service statistics, data on wife's age and parity of the couple are available for over 90 per cent of sterilized couples and for over 80 per cent of IUD acceptors. Table 6 provides the distribution of acceptors by age for the three years, 1977-78 to 1979-80. The mean age of wives of vasectomy acceptors in 1979-80 was 31.9 years, that of tubectomy acceptors 30.4 years and IUD acceptors 28.2 years. The mean age of MTP acceptors was only 28.0 years. The mean age of vasectomy, tubectomy, and IUD acceptors had not changed over the three years. Mean age at acceptance of IUD was lower than at sterilization. About 50 per cent of tubectomy acceptors were under 30 years of age while the corresponding percentage was about 38 for the wives of vasectomy acceptors.

Table 5 : Percentage of Eligible Couples Effectively Protected in Rural and Urban Areas by State by Method for 1980-81

State	Sterilization				IUD insertions and CC users				All methods			
	Rural	Urban	State	U/R*	Rural	Urban	State	U/R*	Rural	Urban	State	U/R*
Andhra Pradesh	21.5	43.4	25.7	2.0	0.4	0.8	0.5	2.0	21.9	44.2	26.2	2.0
Assam	11.7	85.8	17.8	7.3	0.5	4.2	0.8	8.4	12.2	90.0	18.5	7.4
Bihar	10.1	23.6	11.3	2.3	0.4	1.5	0.5	3.8	10.5	25.1	11.9	2.4
Gujarat	29.5	32.0	30.2	1.1	2.3	5.3	3.1	2.3	31.8	37.3	33.3	1.2
Haryana	18.5	44.2	22.9	2.4	4.9	10.2	5.8	2.1	23.6	54.4	28.7	2.3
Jammu & Kashmir	6.7	20.8	9.1	3.1	1.2	2.9	1.5	2.4	7.9	23.7	10.7	3.0
Karnataka	20.3	22.8	20.9	1.1	2.1	3.0	2.3	1.4	22.4	25.8	23.2	1.2
Kerala	20.5	77.5	29.7	3.8	1.0	2.1	1.2	2.4	22.5	79.9	30.9	3.6
Madhya Pradesh	19.3	26.0	20.3	1.3	0.7	2.7	1.0	3.9	20.0	28.7	21.3	1.4
Maharashtra	30.6	39.5	33.2	1.3	0.2	4.2	1.1	21.0	30.8	43.7	34.6	1.4
Orissa	23.3	35.1	24.3	1.5	1.0	3.2	1.2	3.2	24.3	33.3	25.4	1.6
Punjab	19.2	19.3	19.2	1.0	5.5	6.4	5.7	1,2	24.7	25.7	24.9	1.0
Rajasthan	9.2	26.0	12.1	2.8	0.8	4.4	1.4	5.5	10.0	30.4	13.5	3.0
Tamil Nadu	17.0	48.4	26.4	2.8	0.6	2.8	1.3	4.7	17.6	51.2	27.6	2.9
Uttar Pradesh	7.3	13.8	8.1	1.9	2.4	4.4	2.7	1.8	9.7	18.2	10.8	1.9
West Bengal	20.9	27.0	22.3	1.3	0.9	2.2	1.2	2.4	21.8	29.2	23.5	1.3
INDIA	16.4	35.5	20.0	2.2	2.1	5.2	2.7	2.5	18.5	40.7	22.7	2.2

*Ratio of urban to rural percentage of eligible couples protected.

The rural and urban estimates were prepared by the authors.

Source: Ministry of Health and Family Welfare (1982), p. 86.

Table 6 : Percentage Distribution of Acceptors of Vasectomy, Tubectomy and I.U.D. in India by Age of Wife at Acceptance from 1977-78 to 1979-80

Method /Year	Total No. of acceptors in the year	Percentage of acceptors reporting age	Percentage acceptors by age of wife				Mean age
			Upto 24 years	25 to 39 years	40+ years	Less than 30 years	
Vasectomy							
1977-78	187,609	93.2	14.0	77.9	8.1	42.6	31.5
1978-79	390,922	92.4	9.6	80.2	10.2	36.7	32.4
1979-80	472,687	93.0	10.5	82.6	6.9	38.3	31.9
Tubectomy							
1977-78	761,160	90.7	15.0	82.1	2.9	52.6	30.1
1978-79	1,092,985	91.4	13.4	83.5	3.1	49.4	30.4
1979-80	1,305,237	92.8	13.6	82.7	3.7	50.1	30.4
I.U.D.							
1977-78	325,680	83.7	32.4	65.2	2.4	65.9	28.1
1978-79	551,551	86.1	30.7	66.8	2.5	64.2	28.3
1979-80	634,509	83.5	31.7	65.7	2.7	65.2	28.2

Source: Ministry of Health and Family Welfare (1982), p. 95.

In 1979-80, the mean number of living children at acceptance was 2.7 for IUD, 3.5 for vasectomy and 3.7 for tubectomy. The mean number of living children for vasectomy acceptors had substantially increased from 3.1 for 1977-78 to 3.4 for the next year and further to 3.5 for 1979-80. For tubectomy acceptors, the corresponding mean value had increased only marginally from 3.5 to 3.7 during this period. Since tubectomy, in many cases, was performed immediately after child birth, a slightly higher mean number of living children for tubectomy acceptors as compared with vasectomy acceptors is to be expected. The percentage of couples accepting family planning with three or less living children was 75 for IUD, 60 for vasectomy and 52 for tubectomy. Thus women with fewer living children were prepared to accept IUD, since it was a reversible method (Table 7).

These findings have consequences for the programme strategy and for its fertility impact. Social values and family institutions require each couple to have at least one surviving son, particularly in rural areas. With high infant and child mortality rates, a couple would not risk undergoing sterilisation before having at least two sons since, in practice, a sterilisation operation is irreversible. If reversible methods such as IUD condom and the pill are readily available, couples are likely to use them at an earlier stage of family formation, both for spacing and limiting, with the assurance that they could have another child, if needed. They may later shift to the irreversible method of sterilisation after ensuring that they have a surviving son.

Table 7 : Percentage Distribution of Acceptors of Vasectomy, Tubectomy and IUD in India by Number of Living Children from 1977-78 to 1979-80

Method/Year	Total number of acceptors in the year	Percentage acceptors reporting living children	Percentage of acceptors by no. of living children							Average No. of living children
			0	1	2	3	4	5 or more	3 or less	
1	2	3	4	5	6	7	8	9	10	11
Vasectomy										
1977-78	187,609	81.0	0.1	3.4	34.8	29.3	22.6	9.8	67.6	3.1
1978-79	390,922	86.8	0.0	1.7	27.6	31.9	22.0	16.8	61.2	3.4
1979-80	472,687	93.2	0.0	1.6	25.3	32.6	23.3	17.2	59.5	3.5

TABLE 7—*Concld.*

1	2	3	4	5	6	7	8	9	10	11
Tubectomy										
1977-78 . .	761,160	86.3	0.0	1.6	20.4	34.6	29.7	13.7	56.6	3.5
1978-79 . .	1,092,985	88.6	0.0	1.9	17.7	34.0	25.7	20.7	53.6	3.7
1979-80 . .	1,305,237	92.6	0.0	1.2	16.7	34.4	27.5	20.2	52.3	3.7
IUD										
1977-78 . .	325,680	80.7	1.2	21.0	32.3	22.8	15.2	7.5	77.3	2.6
1978-79 . .	551,551	83.0	0.9	17.2	29.4	25.3	16.3	10.9	72.8	2.8
1979-80 . .	634,509	83.5	1.5	18.7	30.7	24.4	14.8	9.9	75.3	2.7

Source: Ministry of Health and Family Welfare (1982), p. 105.

Currently, the predominant method of the programme is sterilisation which is accepted only at higher parties of couples and has limited impact on fertility. Hence, there is a need to change the programme strategy and to make IUD's and conventional contraceptives more readily available to a larger number of couples. This would broaden the choice of methods available to couples, while at the same time, reducing the parity at acceptance and increasing the fertility impact of the programme.

MTP acceptors are, on the average, younger than those who accept any other method. It is possible to use MTP as a back-up for the failure of temporary methods such as condoms, pills and IUD's. This would increase enormously the use effectiveness of such methods in the programme. Repeat abortions are a health hazard to women. Women having repeat abortions can be encouraged to use contraceptives or undergo tubectomy. Integration of MTP as a programme method can, therefore, strengthen the programme in several ways.

Fertility Impact of the Programme

The performance of the programme in terms of acceptance and prevalence of family planning methods, has been discussed in the last section. These variables determine the direct and immediate performance of the programme.

Since definite targets for reduction in the birth rate have been set for the Family Planning Programme in the Five Year Plans, it is essential to evaluate the fertility reduction brought about by the programme. There are, certainly, many other demographic and social factors which also lead to a decline in fertility. The proportion of women in reproductive ages, the age structure of reproductive women, proportion of married women and couple survival are the more important demographic factors affecting fertility. Education, age at marriage, roles and status and work participation of women, marriage, family structure and kinship pattern are the major social factors affecting contraception and fertility. The Family Planning Programme impact on fertility is the effect on fertility of couples using family planning methods provided by the programme, the other demographic and social factors hypothetically remaining the same.

In the present analysis, the impact of the Family Planning Programme on fertility has been assessed in terms of two measures, the percentage of couples protected against the risk of conception and the number of births averted in different years by various contraceptive methods. The method of computing the number of couples protected has been outlined and the performance of the programme discussed in terms of this measure in the last Section.

The number of births averted by the programme is estimated by following a cohort of family planning acceptors in a year distributed by wife's age. This cohort of couples is followed through their reproductive span and the attrition due to mortality of either spouse and due to discontinuation and failure of the method is obtained. The number of surviving marital unions continuing to use family planning in each subsequent year is thus calculated. The number of births that would have occurred to them in different years is estimated in accordance with a potential schedule of age-specific fertility rates in the base year, 1960-61. This is the number of births averted by the acceptor cohort in each successive year on the basis of the 1960-61 fertility level. The number of births averted by the programme in a particular year is obtained as the sum of the births averted in that year by all cohorts of acceptors, past and current.

Sterilization averts births throughout the women's reproductive life after the operation, as long as she remains currently married. For IUD insertions, protection may also cease if the device fails or is expelled or removed. Hence both methods avert births in the year of acceptance and in subsequent years. For conventional contraceptives, protection lasts only as long as they are used and the number of births averted is calculated on an yearly basis, considering only current and effective users. This briefly is the procedure used by the Ministry of Health and Family Welfare (1979a) for calculating the births averted in each year by the programme.

The number of births averted is an estimate of the number of births that would have occurred had there been no Family Planning Programme. Table 8 shows the number of births averted per 1000 population by

the programme since 1965-66. This is the births averted rate (BAR) which is a summary measure of the fertility impact of the programme.

BAR increased from 0.5 in 1965-66 to 3.5 in 1970-71, a 3.0 points increase in five years. From 1970-71 onwards BAR increased gradually to 6.0 in 1976-77 and then increased steeply to 8.0 in 1977-78. In this year the full impact of a record number of sterilizations done during the Emergency year, 1976-77 was felt. Since 1977-78, BAR declined gradually to 7.3 in 1980-81. This decline reflects the back-lash on revoking the Emergency. In 1980-81, of the BAR of 7.3, 6.3 points was due to sterilization and only 1.0 due to IUD and CC users. The distortions due to the Emergency and the importance of sterilizations in the programme have been noted earlier and are confirmed by the trends in BAR.

Table 8 : Fertility Impact of the Family Planning Programme, 1965-66 to 1980-81: Births Averted Rate (BAR) and Programme Birth Rate (PBR)* Compared to SRS Birth Rate

Year	Mid-Year population (in crores) (a)	BAR. No. of births averted per 1000 population				EBR, birth rate with no programme (b)	PBR,* programme birth rate	CBR from Sample Registration System(c)
		Sterilization	IUD	C.C. users	Total			
1965-66	48.6	0.4	0.1	0.1	0.5	41.3	40.8	
1966-67	49.7	0.7	0.3	0.1	1.1	41.1	40.0	
1967-68	50.8	1.0	0.6	0.1	1.7	40.9	39.2	
1968-69	51.9	1.7	0.6	0.1	2.4	40.6	38.2	
1969-70	53.0	2.2	0.6	0.2	3.0	40.4	37.4	
1970-71	54.2	2.6	0.6	0.3	3.5	40.2	36.7	36·8
1971-72	55.4	2.9	0.6	0.4	3.9	40.0	36.1	36.6
1972-73	56.7	3.5	0.5	0.5	4.5	39.9	35.4	35.8
1973-74	58.0	4.2	0.5	0.5	5.2	39.9	34.7	35.1
1974-75	59.3	4.2	0.4	0.6	5.1	39.8	34.7	34.3
1975-76	60.6	4.3	0.4	0.5	5.2	39.7	34.5	34.6
1976-77	62.0	5.0	0.4	0.7	6.0	39.7	33.7	34.1
1977-78	63.4	6.9	0.4	0.7	8.0	39.8	31.8	33·5
1978-79	64.8	6.7	0.3	0.6	7.6	40.0	32.4	33.2
1979-80	66.3	6.5	0.3	0.6	7.4	40.1	32.7	
1980-81	67.7	6.3	0.4	0.6	7.3	40.2	32.9	

*This birth rate is expected with programme only.

(a) The mid-year population figures were obtained by exponential rate of growth using 1961, 1971 and 1981 Census population figures

(b) Pivotal figures taken from Ministry of Health and Family Welfare (1979), p. 15.

(c) The SRS estimates for the calendar years, from the Office of the Registrar General (1981), were converted to correspond to financial years.

It is necessary to check the validity of BAR as a measure of the actual impact on the birth rate. For this a constant schedule of age-specific marital fertility in 1961 was estimated. This schedule was derived from the Fourteenth Round of the National Sample Survey after scaling the rates upwards to produce a birth rate of 41.7 that was estimated for the decade 1951-61 from the Census. Age-specific proportions of married women from 1961 and 1971 Censuses were extrapolated to 1976 and 1981. The number of women in each reproductive age group was obtained from official population projections. Applying the constant schedule to the number of married women, the birth rate was estimated for 1971, 1976 and 1981. These expected birth rates (EBR) assume the constant fertility schedule of 1961 with no family planning impact but allow for changes in the percentage of married women in reproductive ages and the proportion married by age group. The interpolated values of EBR from 1965-66 to 1980-81 are shown in Table 8. To obtain the birth rate under the impact of the programme, the fertility impact of the programme, BAR, is subtracted from the hypothetical birth rate with no programme, EBR. The programme birth rate (PBR), thus obtained, is shown in Table 8.

The programme birth rate may be compared to the birth rate from the Sample Registration System (SRS), published by the Office of the Registrar General (1981). However, there are some problems in directly comparing the levels of the two series. PBR is calculated with a base figure of 41.7 for 1951-61. But alternative estimates have been made for the same period in the range 41 to 46 (Rele and Sinha, 1970). Hence the level in the base year is subject to some uncertainty. The completeness of coverage and the reliability of SRS rates have not yet been firmly established. Nor have the trends in SRS rates been reconciled with the 1981 Census results. It is, therefore, safer to compare the decline in PBR with the decline in the SRS birth rate.

PBR declined from 36.7 in 1970-71 to 32.4 in 1978-79, by 4.3 points in 8 years. The decline in the SRS birth rate over the same period was 3.6 points. It should be noted that the decline in the SRS rate is due both to the programme impact and social factors, such as the roles, status and education of women whereas the decline in PBR is only due to the programme impact. The net effect of social changes on fertility is expected to be positive rather than negative, although both anti-natal and pro-natal changes are involved. Hence the decline in PBR should be less than the decline in the SRS rate. But it is actually found that the PBR decline of 4.3 points was larger than the SRS decline of 3.6 points. This indicates the method of estimation of births averted by the programme and the assumptions made tend to overestimate the number of births averted and hence also the fertility impact. More careful and detailed analysis by States should reveal the deficiencies of this method more clearly.

Programme Prospects in the Light of 1981 Census Results

The 1981 Census count placed, provisionally, the population of India at 68.4 crores as on 1st March, 1981. The average annual exponential rate of growth of population was 2.23 per cent as compared to 2.20 per cent recorded in the previous decade, 1961-71. Thus the growth rate for the country as a whole remained at 2.2 per cent per annum over the last two decades. However, the 1981 Census showed that for some States, notably Kerala, Orissa and Tamil Nadu, the growth rate had declined substantially, in the recent decade 1971-81. Other States like Haryana, Gujarat, Madhya Pradesh, Maharashtra and West Bengal had shown moderate declines while States like Bihar, Karnataka, Rajasthan and Uttar Pradesh had recorded an increasing trend in their decadal growth rates. Thus it appears that the different States of India are at different stages of demographic transition.

On the whole, the decadal rate of growth of population has recorded a declining trend in nine of the sixteen major States, accounting for 47 per cent of India's population. The level of the growth rate in Madhya Pradesh and Orissa may be attributed partly to out-migration to other States while for States like West Bengal it may be attributed in part to in-migration across international borders during 1971-81 decade.

An analysis of population growth rates in 1971-81, level of contraceptive use in 1980 and female literacy level in 1981 by States of India reveals that, in general, a negative association exists between the percentage of eligible couples protected and population growth rate, and a positive association exists between the levels of female literacy and contraceptive use, although this pattern of relationship does not hold for a few States (Srikantan and Saxena, 1981). For example, Maharashtra, has had the best family planning performance among all the States of India but its growth rate was not the lowest. The States that have been successful in family planning also seem to have been successful in increasing their literacy rates.

Based on the analysis done in this paper and on the preliminary results of 1981 Census, the problems and prospects of the programme for realizing the demographic goals are assessed below.

The programme has been run so far entirely by the government without any significant participation by the people. The building up of public opinion, the involvement of voluntary agencies in population education and family planning activities and the commitment of local communities to family planning have been rather limited thus far. It is necessary to mobilize public opinion at all levels and to make the programme a people's programme rather than a government programme.

The programme is fully funded by the Central Government, almost exclusively implemented by the State Governments and the targets are set jointly. This dualism creates a lack of commitment on the part of some States towards the effective implementation of the programme, since generally no state funds are spent on it. Allocation of a percentage of development funds on the condition that the family planning targets are fulfilled has been tried. But, instead of improving the performance of laggard States, this might increase the disparities, since better performing States get more funds.

The funding of the programme by the Central Government has led to rather rigid and uniform norms for staffing and family planning activities of the health centres. However, there are wide variations in the institutional, social and economic conditions among the States. Hence there is little margin left for the adaptation of the programme to suit local conditions and circumstances. If the programme is to operate more efficiently in all parts of India, there should be greater flexibility to modify the programme according to the special needs of each State. For instance, various types of incentive schemes for family planning acceptors can be devised, in cash or kind, and with immediate or deferred payment. The incentive scheme has to be tailored to the conditions prevailing in rural and urban areas of each State in order to increase acceptance.

The medical and para-medical staffing of rural centres also poses problems. Greater use of para-medics, upgrading of the skills of indigenous midwives, better

building and other facilities and special allowance for the rural staff, compulsory rural internship for medical students are some of the possible steps that have been suggested. With improved rural education, persons suitable for para-medical training may be found within the village itself. Improvement in family planning supplies and transport to health centres form part of the strategy of integrated rural development.

The present health infra-structure is not adequate for providing continuing maternal and child care. Hence the Family Planning Programme has to resort to episodic activities like mass vasectomy and tubectomy camps. In the long-run, it is necessary to develop the health system for providing continuing care to mothers and children. This would improve the accessibility and availability of reversible methods like IUD, condom and the pill, and encourage their use both for spacing and limiting the family size. It would also improve the follow-up care of acceptors of these methods as well as sterilization.

Improvement in the availability of suitable contraceptive methods needs attention. The ideal contraceptive would be one that is completely effective against conception and has no other side effects, does not need repeated visits to the health centre or repetitive daily use, can be used in local living conditions and available privacy, is affordable by couples, and is a reversible method. Biomedical research is still engaged in developing such a contraceptive which fits, medically, socially and economically the local conditions and culture. Such new methods as laparotomy are being successfully tried in some centres.

The predominant methods used in the Indian programme is sterilization. While it meets many of the needs of the couple, its major disadvantage is that it is irreversible. Therefore, it is accepted only at higher parities when the couples are sure that they have completed their family and fertility impact of sterilization is, to that extent, reduced. As mentioned earlier, development of the health system to provide maternal and child care on a continuing basis would improve the acceptance of temporary methods like IUD, condom and the pill. These methods may be more readily accepted at lower parities and couples may undergo sterilization at a larger stage. This sequence of family planning use would reduce, for the individual couple, the risk of not having as many living children as they want and increase the fertility impact of family planning. In such a health system, better follow-up care can be given to acceptors of both temporary methods and sterilization.

Availability of MTP should serve as a back-up for the failure of temporary methods. MTP should provide safer abortion for women resorting to non-medical abortion. Women undergoing repeated abortions could be encouraged to use contraceptives or undergo sterilization. In fact, a combination of temporary methods, sterilization and MTP should go a long way in providing couples with family planning methods that would best suit their individual needs and, at the same time, increase the impact of family planning on fertility.

So far, in India, goals and targets have been set for the Family Planning Programme on considerations of macro-economic development, the regulation of aggregate fertility levels and the stabilization of India's population. The programme has been implemented by the government and an infra-structure has been developed to deliver family planning services to the people. However, not much attention has been paid to the creation of a demand for family planning methods.

The demand for family planning arises in the family where the decision is made on the number of children to be borne by the wife. This decision is contingent on such factors as family type, the roles and status of wives within and outside the family, and parental expectations regarding economic and social support by their children. The decision on the number of children to be borne also depends on the education, age at marriage and rural or urban residence of the wife and relevant characteristics of the husband. There are many externalities involved in this decision since all the social costs involved in having children do not squarely fall on the couple or even the family.

For forecasting the demand and setting targets for family planning it is necessary to understand the values and constraints that individual couples and families have for children. There are many socio-demographic surveys that provide empirical knowledge on aspects of family size values and decisions by individuals. It is beyond the scope of this paper to review the findings on the demand for family planning. But, in the long-run, to stabilize India's population, it is necessary to bring social values and institutions more closely in conformity with the national goals on fertility and to reduce the externalities and contradictions involved in the pursuit of individual family welfare with that of national development. In India's traditional and diverse culture, resolution of these conflicts is going to be neither easy nor quick. But, in the long-run, only such social changes would create the demand for family planning and ensure the success of the Family Planning Programme.

References

Ministry of Health and Family Welfare (1975), *Family Welfare Programme in India, Year Book* 1974-75, Government of India : New Delhi.

——(1976), *National Population Policy : A Statement of Government of India*, Government of India : New Delhi.

——(1977), *Family Welfare Programme : Towards a New Policy*, Government of India : New Delhi.

——(1978), *Family Welfare Programme in India, Year Book* 1976-77, Government of India : New Delhi.

——(1979a), *A Note on Estimation of Births Averted and Couples Protected*, Government of India: New Delhi.

——(1979b), *Family Welfare Programme in India, Year Book* 1977-78, Government of India : New Delhi.

——(1980), *Family Welfare Programme in India, Year Book* 1978-79, Government of India : New Delhi.

——(1981), *Family Welfare Programme in India, Year Book* 1979-80, Government of India : New Delhi.

——(1982), *Family Welfare Programme in India, Year Book* 1980-81, Government of India: New Delhi.

Office of the Registrar General (1981), *Sample Registration Bulletin,* Vol XV, No. 1, Ministry of Home Affairs: New Delhi.

Pai Panandikar, V. A., R. N. Bishnoi and O. P. Sharma (1981), *Organizational Policy for Family Planning,* Centre for Policy Research: New Delhi, pp. 234-240 (Mimeo).

Rele, J. R., and U.P. Sinha (1970), "Fertility and Mortality in India 1951-60", *Studies in Family Planning,* edited by Ashish Bose, P.B. Desai, and S. P. Jain. Allen and Unwin :London, pp. 212-225.

Srikantan K. Sivaswamy and Swati Saxena (1981) "1981 Population Census Results in Perspective" *The Journal of Family Welfare,* XXVIII (2), pp. 5-16.

Srikantan K. Sivaswamy, K. Balasubramanian and Surekha Nikam (1982), "Performance of India's Family Planning Programme", Background paper prepared for the conference on *India's Demography,* held at Worcester College, Oxford, December 14-16, 1982.

POPULATION POLICY AND PROBLEMS IN IMPLEMENTATION

S. S. NAIR

1. Introduction

The rapid growth of population has become a major topic of discussion all over the world and it has also invoked concern on the part of various national Governments and international agencies. This has resulted in development of official population policy and launching of National Family planning Programme in many countries, particularly, developing countries. A number of international conferences have also been organised during the last decade to focus on the consequences of this rapid growth in population and also the ways and means needed to curb the present high level of growth. The rapid population growth has economic and social implications. It also affects many nation-wide activities such as providing food, housing, health, education, employment, transportation, etc., maintenance of law and order and the quality of environment in which people live. The quantitative and qualitative improvements in the provision of these services, require large investments which are difficult for want of resources. The net result is mal-nutrition, poverty, mass illiteracy and unemployment amongst a large number of people, as in India. Defining poverty line in terms of per capita monthly expenditure of Rs. 61.8 for rural and Rs. 71.3 for urban areas at 1976-77 prices, it has been estimated that nearly 48% of the rural population and 41% of the urban population was below poverty line in 1977-78. The population policy and general development strategy are two sides of the same coin. Uncontrolled growth of population in the Indian context, as for any developing country, has profound implications for the development plans and the concomitant problems of food supply, housing, health, education, employment, etc.—in short for all the essential dimensions of quality of life which our Five Year Plans wish to ensure to the general masses.

2. Demographic situation

The demographic situation in India is still serious today. The decennial growth rate has accelerated over the last 50 years and the annual growth rate was at a peak level of over 2 per cent during 1960s and 1970s. The accelerated growth rate over the period coupled with the high base to which the increase occurs further under-scores the seriousness of the problem. The main factor responsible for the accelerated growth has been the rapid decline in the death rate from 31.2 during 1931-41 to 27.4 during 1941-51 to 22.8 during 1951-61 and 19.0 during 1961-71. The birth rate during the same period, on the other hand, has decreased more gradually (by 4 points) only and was still above 40 (41.2). The population of the country has been increasing of late, at over 1 million every month.

In absolute numbers, India has the second largest population after China and one of the highest densities in the world. Although its land area is less than 2½ per cent of the World's total land area, it has 15 per cent of the world's population. The country's population was 238 million in 1901. By 1951, it increased to 361 million, showing a 52 per cent rise in 50 years. In the next two decades, i.e. by 1971, it rose to 548 million as a result of another increase of 52 per cent in just 20 years. According to the 1981 Census, the population of India has gone up to 685 million as on 1st March, 1981 and if the present rate continues, it may rise to 950 million by the turn of the century. The age structure of the population has a broad base which further under-scores the seriousness of the situation. As per 1971 Census, 42 per cent of the population was below 15 years of age which means a high dependency ratio, a heavy burden on the wage earners and larger additions to the reproductive age group in future. The younger age structure of the population required considerable resources to feed, clothe, house, educate and equip for productive activity. The larger additions to the reproductive age group has the potential for many more births than at present.

The sex ratio which is presently 935 females per 1000 male population, has been consistently declining till 1971 but registered a slight increase in 1981. Kerala is the only State where there are more females than males. The rate of urbanisation has been rather slow. The percentage of urban population has risen gradually from 14.0 in 1941 to 17.3 in 1951, 18.0 in 1961, 19.9 in 1971 and 23.7 in 1981.

3. Population planning in India

India entered the era of development planning in 1951 with the launching of the First Five Year Plan. The Family Planning Programme specifically aimed at bringing about reduction in the birth rate, was launched a year thereafter in 1952 as the trends in population growth caused a serious concern to the Government and it was felt that some action was needed in the field of population in addition to the measures for general development including improvement in public health. The start was modest and more or less exploratory in nature. In the beginning, the emphasis has largely been on provision of services in clinics and expecting people to come and utilise the services. But, gradually, the policy underwent several changes such as adoption of the extension approach, providing for different methods for a cafeteria approach etc. in the light of the experience gained in the implementation of the programme. The programme also became goal-oriented in 1966-67 whereby targets for reduction in birth rate were laid down

for each Five Year Plan. The policy as it stands now, has been made more broad-based by incorporating all aspects of family welfare in the programme, particularly, those which are designed for increased acceptance of family planning and promotion of the health of mothers and children by integration of maternal and child health and nutrition programmes during the Fifth Five Year Plan (1974-1979). The programme is a wholly voluntary programme and the stress is on education and motivation of the masses to accept the small family norm and the preventive and promotive care of mothers and children as well as to bring the services closer and closer to the homes of the people, particularly, the weaker sections in rural areas and urban slums so as to effect improvements in their quality of life. The programme has received relatively higher priority in successive Five Year Plans as is evident from the investment in the programme which has increased from Rs. 6.50 million ($ 0.8 million) in the First Five Year Plan (1951—56) to Rs. 10,100 million ($ 1,262 million) in Sixth Five Year Plan (1980-85). This programme is one of the programmes included under the new 20-point programme.

4. Implementation of the Programme

The Family Welfare Programme is a centrally sponsored programme. The programme is implemented through the State Governments, local bodies and voluntary organisations for which cent per cent central assistance is provided. In the rural areas, the programme is implemented through a net work of over 5,500 Primary Health Centres and 50,000 Sub Centres, besides centres established by non-government organisations. To provide services and essential infra-structure to reach the poorer sections, the health and family planning infra-structure has been recently reshaped and re-designed to make the delivery system more effective and to ensure participation and involvement of the people. Accordingly, primary health care, family planning and maternal and child health services are being delivered as a package.

5. Achievement under the Programme

The number of eligible couples in India was estimated at 119 million in March, 1982. Amongst the different methods offered free under the programme, the most effective method is sterilisation; 36.3 million have opted for it since the beginning of the programme. IUD has been accepted by 9.5 million women. A massive effort is now on to promote non-terminal methods, particularly IUD, condom and oral pills and to motivate more younger couples to accept these. The present users of conventional contraceptives are approximately 4.4 million as against about 3 million new sterilisations and about 0.7 million new IUD insertions during last year. Taking into account attrition caused by age, mortality, discontinuation of IUD and other factors, the number of couples currently practising family planning is approximately 30.3 million. These couples constitute 25.6 per cent of the total number of couples in the eligible age group. Making allowance for use effectiveness of methods which is taken as 100 per cent in the case of sterilisation and oral pill and 95 per cent for IUD and 50 per cent for conventional contraceptives, the percentage of couples effectively protected as of March '82 is 23.7 per cent. The important thing to note today is the fact that younger groups are coming forward increasingly for adoption of family planning as a way of life.

6. Impact of the Programme

Population growth rate which steadily increased from 13.1 per cent in the 1941-51 decade to 24.8 per cent in the 1961-71 decade has stopped increasing further, being 25.0 per cent in the 1971-81 decade. This is a substantial achievement. But for the family welfare programme, the growth rate could have been much higher. It is estimated that as a result of the family welfare programme, 37 million births have been averted during the 1971-81 decade. These births, if they had taken place, would have resulted in adding 29 million more persons (allowing for mortality and other factors) to the population and the resultant growth rate could have been about 30 per cent instead of 25.0 per cent in the 1971-81 decade. Since the inception of the programme and upto the end of March, 1982 an estimated 49.2 million births have been averted.

Of the 31 States and Union Territories 15 (with 47 per cent of the 1981 population) have shown a lower growth rate during the 1971-81 decade than that registered during the previous decade. Only eight such States and Union Territories (with 13 per cent of the 1971 population) had shown a decline in 1961-71 as compared to the previous decade. Apart from this encouraging trend, it is a matter of some satisfaction that half of the country's population is already subject to a decrease in growth rate.

7. Current Basic Strategy

The slogan that "Development is the best contraceptive" is catchy and convincing, but hardly capable of easy implementation for results. However important development may be for checking population growth, one cannot wait for it to take place as a prerequisite to usher in small families. There are, on the contrary, adequate instances in the world, including some parts of India, to show that family planning alone can be relevant and evoke, at least in the early stages, quick response even in situations of under development, illiteracy and low economic order of life. Such responses are likely to lead to a better sharing of the fruits of development and thereby help to break the vicious circle of underdevelopment and population growth. About one-fourth of the four hundred and odd districts in India have achieved couple protection levels higher than 30 per cent. Further, many more districts have also faired quite well. As a result of all these, as stated earlier, about half of the country's population is already subjected to overall decree in growth rate. All these areas are likely to experience the consequent early benefits of population control soon. These have been possible inspite of lack of adequate development. Kerala state which has one of the lowest per capita incomes in the country is in the forefront in reduction of fertility and

mortality. Examples such as Orissa State, where in one district the couple protection level has reached over 40 per cent and in another will be reaching 40% soon, in spite of obvious socio-economic backwardness are also pointers in this regard. There is a strong evidence of a backlog of huge unmet demand which can be tapped by provision of services and supplies in a manner most acceptable to a given population.

However, there is no doubt that various developmental efforts, especially those related to improvement in female literacy, status of women, gainful employment of women and general social and economic uplift of vulnerable sections do have an important role in making more people adopt a small family norm. It is also true that majority of the people well below the poverty line may still be considering children more as economic assets than mouths to feed and bodies to clothe and may not be inclined to have fewer children and strive to give them a better future than what they themselves have. Thus, for synergistic effect on the population situation, development may have to go hand in hand with population control measures.

The basic strategy under the Family Welfare programme has been evolved under the above context. This consists of the following:—

(1) education and motivation of the masses regarding the small family norm;

(2) integration of family welfare programme with health measures predominantly catering to the vulnerable groups consisting of women and children who constitute 70 per cent of the entire population;

(3) general programme of socio-economic development;

(4) integration of the family welfare programme with more and more of the other developmental programmes, particularly those with an extension approach;

(5) concurrent monitoring and evaluation of the programme in a continuous manner to get a proper feed back for better programme performance and

(6) research into various aspects of the population problem for further evaluation of the programme and into bio-medical aspects to improve existing contraceptive technology and evolve easier, simpler, safer and inexpensive contraceptives.

Particular stress is laid on the provision of services and supplies as close to the door-steps of the people as feasible, by continuous expansion and upgrading of the required facilities and improvement in the perceptions, skills and competence of all levels of workers in the health and family welfare systems by a process of continuous education and training.

For motivating and educating the masses about the advantages of the small family norm all channels of the mass media are being utilised. At the Central, State and Districts levels, mass education and media set ups are functioning. Guidance is given to them from the Central level in relation to policy and implementation strategies. At the block level, Extension Educator tries to make use of the individual and group approaches in order to have more intimate communication with the people. The media is reaching practically all sections of the population and all communication media viz., the cinema, radio, press, print media, outdoor publicity media and even folk media are being utilised in the programme. The major stress is, however, on practising family planning and mother and child care by the married couples in the reproductive age groups and on the postponement of marriage. Separate schemes are also being undertaken to reach the workers in the organised sectors. The voluntary organisations like Family Planning Association of India, All India Workers Federation, and also employer organisations commanding respect among the people and workers are also encouraged to take up motivational work in relation to population control.

The aim is to make the programme a people's movement with their willing participation. To achieve active non-official participation in the promotion of the Family Welfare Programme and to increase its acceptance by the people, Orientation Training Camps are also being organised. The objective of these Orientation Training Camps is to orient the influential village leaders, who enjoy confidence of the people and have great potential as change agents, about the importance of the Family Welfare Programme and educate them about different family planning methods, remove misconceptions etc. and thereby enlist their active support to the Family Welfare Programme, particularly, at the village level. A large number of village Health Guides (preferably women) have been trained to have a focal point in each village for education and motivation of couples and to provide supplies of non-clinical contraceptives and to provide elementary health care.

Another significant stride made towards education of the masses particularly younger population is introduction of population education in the school curriculum. The National Adults Education Programme launched recently also provides for population education. These steps which are in confirmity with the voluntary nature of the programme seek to educate and motivate the masses on the benefits of the small family norm and thereby ultimately lead to their voluntary acceptance of the programme. The basic objective under all these, is ultimately to enlist the support of masses by community involvement through education and motivation. The Government has also launched a number of Schemes which include grants to Women's Organisations, Trade Unions, Youth Clubs, etc.

The Government had enacted a legislation in 1978 for increasing the age at marriage according to which the minimum age at marriage for boys is 21 years and for girls 18 years. The Government also legalised abortion in 1971 under the "Medical Termination of Pregnancy Act", under which legal abortion is

permissible for ensuring the health of the mother, if conception results from the failure of a contraceptive device, etc. The abortion law aims at reduction of deaths of women due to clandestine abortion. For reduction of maternal mortality, the Post Partum Scheme is another important component of India's Family Welfare Programme. It is a hospital based and maternity oriented programme and covers at present 524 institutions providing ante-natal, natal and post-natal services to women and new-born babies. At the time of delivery, the women are normally more motivated than otherwise to accept family planning and this is the underlying objective under this special scheme. During 1980-81 it accounted for 13.9 per cent of sterilisations, and 18.4 per cent of IUD acceptors covered under the total National Family Welfare programme.

Another innovative model tried under the programme from the strategy point of view was the launching of two India Population Projects in six districts of Uttar Pradesh and 5 districts of Karnataka during 1973. The objective of the project was to increase the effectiveness of the programme by providing additional inputs in selected districts which form the project area and to test and evolve strategies that might lead to increased acceptance. Encouraged by the achievement of these two population projects launched during 1973, presently, a number of area projects have been launched in 46 selected districts almost all over the country. These projects also aim at evolving suitable strategies from programme point of view which may result in better acceptance under the programme and which are replicable throughout the country.

Incentives also appear to play an important role in accelerating the family planning performance. The incentives may be in the form of cash or kind or in the form of certain concessions. Attempts are being made to evolve packages of incentives which can be offered to the acceptors in general and to communities, organisations etc.

8. **Future goals and expectations**

The goal now is to achieve a birth rate of 21 and a death rate of 9 by the end of the century. This would mean a couple protection of the order of 60 per cent by then. Infant mortality is also to be brought down to 60 per 1000 live births from a level of 127 (1978).

We recognise these objectives not only as a challenge to the organisation but also to the resources. We have the capability to achieve these long-term objectives designed to improve the quality of life. We also hope that in the long term, many steps that have been taken on the non-programme side, such as raising the age at marriage, uplift of the rural society and improving of the socio-economic status of the masses coupled with multi-directional efforts under family welfare programme, which include a broad based mass education and motivation programme through mass media and orientation training camps of opinion leaders, provision of village Health Guides in all villages, induction of population education at school and colleges levels and also through non-formal channels such as training programmes of development workers, industrial workers, etc. and last but not least matching of supplies and services for contraception with the demand, will help in achieving the overall objectives laid down.

9. **Problems in implementation of the policy**

Family Welfare Programme in India is a wholly voluntary programme. The Government's role is primarily confined to education of the masses about the benefits of the small family and provision of services and supplies. For educating the masses about these benefits, Government is utilising all forms of media but efforts in this direction are handicapped by large size of the country and the illiteracy of the rural masses spread over about 560,000 villages some of which are difficult to reach. Creating awareness among the masses about the benefit of a small family and also about different family planning methods and their availability and facilities for mother and child care is thus a challenging problem. Efforts of the Government have succeeded to a large extent in creating such awareness. However, there is a gap between awareness and acceptance which varies from State to State and is a major problem which we are facing in the implementation of the programme in some States. The Government is aware of this problem and has already taken a number of steps from time to time to fill in these gaps. Mention in this context may be made of the Orientation Training Camps Scheme for orienting the influential village leaders about the need and availability of various family planning methods, launched in a big way in the country since 1977. Another Scheme which deserves special mention here is the launching of village Health Guide Scheme in 1978. In addition, National Adult Education Programme and introduction of population education in school curriculum are further steps taken by the Government in this regard. All these steps are directed towards bringing the desired change in attitudes of the masses through education. But, the vastness of the country (requiring huge resources), multi-religious society, low socio-economic level of the masses, low literacy rate particularly among females, low female work participation, a predominantly rural and traditional society as well as high infant mortality rate are some deterrents in the rapid acceptance of family planning methods. We have yet to raise the masses in some areas to a level where they are able to perceive the benefits of small family and hazards involved in a large family and as such, may come forward automatically for family planning and adoption of mother and child care methods.

Government has undertaken various steps as part of its various Five Year Plans aimed at socio-economic development of the masses. But as indicated above, ours is a vast developing country and as such, it may take time to raise their levels to the extent that they may enthusiastically come forward for acceptance of the different methods. Ours is a male-dominated society and the females have not often much say in the

decision making primarily because of their low literacy and low work participation. Efforts are underway in these directions, but bringing about a change in these directions will be a slow process.

Another problem is the lack of the availability of a simple, safer, cheaper and reversible method of contraception which could be adopted easily by the rural people. Efforts in this direction are also on.

Another hurdle in the implementation of the programme is the preference for sons because of old age security and other religious grounds. People want to have large family so that they have some one to look after them in their old age. No doubt, our educational and motivational efforts under Family Welfare Programme aim at bringing the change of attitude of the masses in these directions. Still, unless the educational and socio-economic levels of the masses are raised, we will have to struggle hard to ensure that almost all couples come forward to accept family planning for spacing of children and adoption of small family norm and modern methods of mother and child care.

To provide adequate service (including follow-up services) and supplies to the large number of people spread throughout the country who want to follow some method of family planning requires the building up of a huge infra-structure, training of large number of doctors and para-medical workers, provided them with vehicles and establishment of a vast network to handle the required and timely supplies. While considerable progress has been made on all these aspects, there is still a lot more to be done to catch up with the ever increasing demand for family planning and mother and child care.

46—5 RGI/ND/84

MARRIAGE SYSTEM AND ITS IMPACT ON FAMILY FORMATION AND FAMILY PLANNING

KANTI PAKRASI

1. Sociocultural Perspective

Marriage and the family are cultural universals. Marriage has been defined to be nothing else than a more or less durable connection between male and female, lasting beyond the mere act of propagation till after the birth of offspring. It implies not only sexual relations, but also living together. Prolonged union of the sexes is, in some way or other, connected with parental duties. The significance of marriage is universally accepted since this very social institution is only one of many means by which a species is enabled to survive. Marriage and family are thus socially inseparable and it has rightly been said that marriage is rooted in family, rather than family in marriage (Westermarck : 1894).

We know that marriage functions to control and provide *guidelines* for sexual activity within the society, following the rules and the regulations upon which members of the group are organized. On the other hand, the family functions as a primary face-to-face group in the preservation and socialization of the young, and it also defines the channels and networks by which membership in a kinship group is determined and continued and by which its wealth-material and non-material is passed down through the generations. In the society marriage is bestowed with additional importance for its unique role in bringing about a permanent bond between two families or even larger groups together. Marriage is the basis for building up proper kinship alliances which are, on the other hand, the basis for social organization in all cultures (Friedl: 1976). Functions of marriage are legion in different societies, yet the institution of marriage may primarily be stressed with respect to a few basic social issues like sexual control and access, parentage & founding a family of procreation, family labour force and subsistence, kinship integration and descent and connubial alliance and social ties against adversaries.

Instances are not rare in human society to expose a social reality that in many peoples *true* conjugal life does not begin before a child is born. Again, marriage is not regarded as complete till the woman has become a mother. For the continuity of family line birth of a male child has from distant past been all the while stressed and at the same time necessary parental care has been asked to be a paramount duty for a married couple for ensuring survival of the offspring. Marriage sanctifies a legal union for cohabitation and gratification of sexual urges of a man and a woman. Conjugal pairs are invariably expected by the society to pave the foundation of legitimate *family of procreation* and again, to perform a definite set of socially approved functions. These functions relate specifically to reproduction, child care and home maintaining. Thus, marriage functions to institutionalize the relationship between spouses following the prevailing norms and eventually it serves to establish the indispensable unit of the society, namely, the family which acts in every society as the most essential social agency for efficient nurturing and training of the growing infants during their prolonged infancy.

Anthropologically it is well-known that with respect to selection in marriage different societies maintain different *codes of conduct* to govern the field of selection, the party to selection and the criteria of selection. Nevertheless, it is no exaggeration that in human society at large the first and foremost objective of marriage is always to affirm formation of a family or procreation. Physical procreation by the partners in marriage has continuingly been desired, encouraged and rejoiced in the very interest of the Family and its wider kinship circle. Innumerable prerogatives have time to time been sanctioned and promoted to facilitate connubial ties in different ways. At the same time the age at which the individuals especially the females should be allowed to enter for the first time the married state remains as a crucial concern to the society. Accordingly, in almost all cultures, participation in full marriage has been generally restricted to those who have at least reached puberty (Gillin and Gillin: 1942). As marriages initiate the reproductive *life-cycle*, the age at which marriages are effected with due societal approval constitutes indeed, an important matter in determining the level of fertility achievements of the married couples. It should be noted that formal marriages do not necessarily coincide with the start of the reproductive life in the country. Age-old customs exercise still substantial impact not only on selection procedures of marriage partner but also on female's age at first marriage and her age at first child birth.

The question of female's age at first marriage has recently assumed an added significance in the face of the National Population Policy which declares that the minimum age of marriage should be raised to 18 for girls and 21 for boys. Since a rise in the age of marriage shall ultimately influence heavily the *effective* reproductive age-span of Indian women this demographic issue has already been given due attention (Das : 1967; Agarwala: 1967; Pakrasi & Malaker : 1979). It has been pointed out that the proposed rise in age at marriage shall have no 'demonstrable demographic impact' on Indian marital fertility. Our society still cherishes to see the maidens in marriage at or very near to the age of their puberty. Law of the land has yet to be accepted fully and wholly by the

Indian families in contravention of the existing customs (Sarkar: 1970). One has, therefore, to give due weightage to the statement that suggests that it is the type of *kinship* organization within which the marriage takes place rather than the *age* at which it takes place which is the determining factor (Hawthorn:1970).

Irrespective of functions of marriage and family, the Hindu Society at large has been following certain rules and regulations to guide the complex pattern of mating in the same caste and not marrying certain kin though of the same caste. Social restrictions continue for centuries together to operate with the principle that no group can maintain its identity and cohesion if it permits *free* intermarriages with out groups. Endogamy i.e., rule requiring marriage within the larger group of birth, has been enforced as a regulatory device to safeguard both social and physical distinctions of a kin group. Barring a few exceptions resulting from the social practice of hypergamy the general rule of endogamy has specified the nature and extent of matrimonial alliances within the group which is, in general, most effectively treated to be one's own (Churey: 1961). But in the society matrimonial alliances can not act efficiently if 'social area of choice of partners in marriage' remains undefined. With respect to this social area of choice of partners the regulation of exogamy (marrying out) bears a significant role. It prohibits marriages between individuals who belong to the same section (*Gotra, Kul* etc.) of a caste. Another important regulation refers to consanguineous marriages. Exogamy prohibits marriages between two individuals related through a common male ancestor upto seventh generation on the father's side and fifth generation on the mother's side.

The institution of marriage and processes of family formation has been in operation in the Hindu Society at large over the last three millenium and these social institutions have in turn influenced greatly the marriage pattern and family formation of other population in the country. Though the influence of the institutions is strongest on the constituent members of the Hindu society, but the Muslims, Christians, Tribals and other communities have not escaped this influence. Among the Brahmins one basic difference exists between the north and the south. The consanguineous (sapinda) regulation has been enforced with greater rigidity in the north, while in the south it was relaxed to conform the prevailing custom of high preference for consanguineous marriages at the time of entry of the Brahman influence in the first millenium B. C. (Sastri : 1955).

Among the Hindu marriage (*Vivaha*) is in essence a ritual and a formality, of course, very important, through which an individual has to go to be able to start his or her life in the householder's role. Hindu marriage is generally accepted obligatory for every person to beget a son in attaining the highest goal (salvation) at the end of life. It is strongly believed that birth of a male child is connected and instrumental to happiness, mental bliss and social harmony both in this world as well as hereafter. Marriage of maidens has continuously been given top most priority in family life and it has been said that a girl who continues to stay in her father's house more than three years after attaining puberty is treated as a very low type. Hence various forms of marriage as monogamy, polygamy, polyandry and group marriage have been socially sanctioned to form a family (Prabhu : 1954).

Thus, in restricting connubial relations some kind of exogamic and endogamic rules have come into force to prohibit sex relation between parent and child, between brother and sister. In some cases such restrictions extends to more remote blood relations. For a Hindu individual marriage signifies a sacramental duty and not of a contractual nature. For a Muslim marriage on the other hand, is a social contract. Marriage is given due importance in both the Hindu and the Muslim society of India for one essential familial act of begetting a son to assist the householder in the discharge of his various sociocultural and religious obligations. Though the family that may be founded by any form of marriage is accepted as the primary social unit of the highest importance for man, it is also a significant medium for instituting a legal reproductive on biological association. Fulfilment of three functions, namely, (1) satisfaction of the sex need of human beings, (2) procreation, care and nurture of the newborns and youngs, and (3) sharing of a home, paves the foundation of a successful family in which sex is not considered as a detached phenomenon, but part of a larger experience of meeting common problems (MacIver and Page : 1949).

Scholarly writings on the importance and the characteristics of Indian marriages are voluminous. Here an attempt has been made to focus only on the essential *framework* of different modes of connubial unions sanctioned by the society as a wohle. At the same time the pattern of family formation through a specific marriage system has been highlighted to stress upon the role of sociocultural usages and also upon the inviable inviolable of codes of conduct ordained by the society for each marriageable person. In developing the present paper primary attention has always been laid upon two facts, namely (1) family-building motives and activities of the Indian couples are as varied as their marriage codes and connubial interdictions and (2) the overt desire for more children is quite evident, irrespective of the form of marital union, among the Indian couple.

II. Marriage System: Polygyny

In the marriage system of polygyny the union of a man with more than one wife at a time is socially approved. In the Hindu society at large this form of marriage prevailed once widely in the country. In the Muslim society in general polygyny is still practised with both societal and religious support. Polygyny highlights plurality of wives and man's dominion over women in the formation of family. Ancient literatures confirm the existence of such mode of family formation right from the vedic times (4000-1000 B.C.). But it is also noted that while polygyny was followed as a socially approved practice, the Vedic ideal of marriage

favoured monogamy (Kapadia: 1955). In this classical treatise on human marriage Westermarck (1894) informed that marriage of a man with more than one woman was favoured among many ancient peoples, several civilized nations and the bulk of savage tribes. In recent time it has been observed that polygamy is scarcely anywhere due to masculine concupiscence (Seligman: 1948).

Several social and biological factors like first wife's sterility, mandatory inheritence of an elder kin's widow, prolonged period of lactation, strict taboo against cohabitation prior to weaning of the last child etc. have been stressed to explain the genesis of polygynous form of marriage. This particular form of mating is also thought to be largely influenced by economic conditions of the families involved in polygyny. Whatever might be the precise reason, it is quite clear that human propensity for acquiring two or more wives on a wide scale is incompatible with the conditions of a stable population. Lorimer observed that assuming approximate equality in number males and females the relative availability of men and women as spouses is sure to be influenced primarily by age-patterns of marriage. Difference in age at marriage, if men marry later than women, may lead to some excess of potential wives. Polygyny is expected to disappear or to be greatly reduced in scope in agrarian civilizations.

In an agricultural country like India polygyny has been persisting from long past to recent past among the Hindus. In ancient India the act of acquiring more than one wife marked social distinction and higher social status of the man who could afford to maintain with all obligations, duties and responsibilities a polygynous family and its concomitant kin relations. Moreover, familial need for male children was all along so passionately felt in the Hindu families in general that a second marriage to get a male child was strongly advocated and has been today admitted as desirable on that ground (Kapadia: 1955). In conformity with the strong traditional demand for maintaining the continuity of family line through male progenies, the social sanction for polygynous marriages was always ready for those who were anxious to have more than one legal wife at a time. A member of the society should have the privilege to marry more than once in case the first marriage fails to promote its true object of begetting a male child. This appears to be the main idea underlying the polygynous marriage system in India (Valavalkar: 1939; Pakrasi: 1970).

Muslim laws treat marriages as a civil contract, imparting mutual duties and obligations and never an indissoluble sacrament. It has been stated that among the Muslims social permission to marry more than one woman at a time is a necessary emergency provision for the preservation and fostering of high social values and for safe-guarding society against promiscuity (Khan: 1862). Plurality of wives and religious sanction for easy divorce without going to court of law appear to be the two essential features of Muslim polygynous society.

In India theoretically a man might effect multiple marriages at a time, but in practice a second wife was rarely taken while the first wife was alive. In the beginning of the present century the excess of wives was found to be highest among the Tribal people and then the Muslims, Hindus and Buddhists ranked in successive order (Gazetteer of India: 1907). But by 1951 no appreciable difference in numbers between married males and marrid females due to polygyny was found. Polygyny; though it existed in the middle of the present century, was definitely very rare (Census of India: 1951).

In the above context, a reference to the Hindu Marriage Act of India (1955) has to be made. This Act orders that (i) neither party shall have a spouse living at the time of the marriage and (ii) the bridegroom should complete the age of eighteen years and bride the age of fifteen years at the time of marriage. Most crucial is the provision which says that any marriage between two Hindus solemnized after the commencement of this Act is void if at the date of such marriage either party has a husband or wife living (Ministry of Law, GOI: 1956).

In a study of the polygynous couples of India (urban) who were surveyed in 1960-1961, it has been observed that the bulk of the polygynists with two wives only were between 17 and 26 years in age at effective marriage at the time of taking *first* spouses and between 22 and 36 years at the time of *second* marriages. Both the Hindu and the Muslim polygynists founded the family with *first* wives by their ages 17 to 26 years. In general, the Muslim polygynists opted for the second wives in relatively higher ages than their Hindu counterparts. On the other hand, senior (first) spouses of the Hindu polygynists were in a large majority of cases below 21 years in age at effective marriage. This feature is equally shared by the senior spouses of the Muslim polygynists. But, the junior (second) spouses of the Muslim males with more than 21 years in age concentrated relatively in higher strength than the second wives of the Hindus. The Muslims allow divorce and widow remarriage and these social practices might explain why the Muslim polygynists possessed in their second marriages relatively more aged women. Thus, in effecting formation of polygynous family the Muslim males show a behaviour pattern which does differ significantly from that of the Hindu polygynists. In the selection of second wife the Muslims depend more on relatively aged women and this should have its due effect on reproductive achievements of their second wives. On the other hand, the Hindu polygynists are noted to prefer very young wives below 15 years in age in both first and second marriages relatively more strongly than the Muslims (Pakrasi: 1970).

Considering many possible sociocultural developments attendant upon the legal strictures on Hindu bigamy we are at once called upon to evaluate the role of polygyny 'as an instrument of demographic expansion'. With the gradual decline in polygynous marriages the Hindus are not unlikely to suffer a retrograde in 'demographic expansion' in the country.

From a study of fertility of polygynous couples in India it has been observed (Pakrasi: 1971) that these couples in general have lower rate of live-births than what is shown by the total couples surveyed in urban India. Moreover, it is quite interesting that in comparison to the Hindu polygynists the Muslim males with *first* wives only maintained the highest average of children born alive, but with *second* wives they yielded the lower average. It is quite significant that through the formation of polygynous families the Muslim males produced by their first wives only the highest average number of live-births and upheld the fact of their 'superior fertility' in India, as pointed out long ago by kingsley Davis (1951). The Hindu polygynists produced through their second wives distinctly more live-births on the average than their Muslim counterparts. Polygynous form of mating does not appear to be an essential prerequisite to invest the distinction of 'superior fertility' with the Muslims of India.

Contextually the question of differential rate of loss of children per couple (Chandrasekhar: 1959) has to be given attention in order to appreciate the implication of superior or inferior fertility of the polygynous families. Average survivors to the polygynous couples-Hindu or Muslim—are observed to be such that the Muslim couples by first marriage not only excelled over other couples in showing the highest number of children but also the heaviest loss of children. In such specific biodemographic situation can the Muslim polygynists be interested in any kind of birth control and/or family planning?

Incidentally we may assess the prospect of family planning in the Muslim families on the basis of several documents that relate to Muslim attitudes toward family planning (Schieffelin: 1967). The documents reflect the concerns expressed by the theologians, political leaders, and commentators of the Muslim society at large to examine the relationship between the Muslim religion and the voluntary limitation of family size. Opinion of the honorable Grand Mufti of Jordan is especially noted here to highlight the basic intent of the Muslim ideals and ideas of family planning. He has said *inter-alia* one of the natural things inherent in human beings is marriage. But the purpose of marriage is procreation for the perpetuation of the species... marriage has been one of the Islamic religious ways and procreation has been one of its desirable and gratifying aims. Even the law-giver views multiplicity with favour, for multiplicity implies power, influence and invulnerability. That is why, in one of the traditions of the Prophet, marriage with an affectionate prolific woman is strongly urged.....Nevertheless, the law-giver has made marriage with a prolific woman and marriage for procreation conditional upon the availability of means and the ability to bear the costs of marriage and meet the expenses of child education and training, so that children may not go to the bad and develop anti social ways.....'restriction of procreation is a legal *afortiori*, because to stop procreation altogether is more serious than to limit it.....there is agreement among the founders of the four Orthodox ways that coitus interruptus is allowed as a means of contraception. Religous savants inferred from this that contraceptives might be used, and even medicines might be used for abortion. Accordingly, we hereby give our judgement with confidence in favour of family planning'.

The statement of the Grand Mufti of Jordan is though quite encouraging to induce the Muslim couples-polygynous or not—in favour of 'restriction of procreation', yet the high level of natality in Muslim society is still an universal experience. From studies on the factors affecting Muslim natality it has been found that Islam has been a more effective barrier to the diffusion of family planning than Catholicism (Kirk: 1965). It is well known that in India pro-natalist social forces still prevail generally in the illiterate, poor peasants and other agricultural folk and at the same time high mortality, especially of infants and children, has very often called for unrestricted reproduction among them. Birth of male child is whole heartedly cherished by each couple for many purposes; for continuity of family line and land ownership; for contribution to agricultural labour, to strengthen family members in village rivalry and strife; for support in old age; for religious intervention at and after death. Moreover, the tradition of joint family system buffers the direct burdens of child bearing on the parents. Under the impact of all these sociocultural and biological factors the desire and motive for adopting voluntary family planning can not very easily make any impression upon the tradition-bound life and living of the Indian couples in general, irrespective of marriage system and family formation.

Indian tradition of large families tends even today strongly to perpetuate the customs of early marriage, the abundant child bearing, and the high rates of population growth. It is urged that reproductive practices of the Indian couples belonging to different religious groups castes and economic classes would have to be examined more systematically with reference to the total social structure within which these practices are operative (Pakrasi: 1966).

III. Marriage system: Polyandry

Of all the marriage systems prevailing still in India *polyandry* occupies a unique position. In this system a woman is socially permitted to have more than one husband at a time. This form of union is customarily practised by the peoples inhabiting the cis-Himalayan tract in Northern India and by some tribes, especially the Todas of South India. Historical evidences confirm that this form of marriage was once a prominent trait of the Brahmanic culture. The classical instance of the five Pandavas of Mahabharata times (500 B.C.-200 A.D.) bears immemorial testimony for the social existence of such a mating system. But polyandry among these different groups and tribes do present different patterns and has different origins and developments (Kapadia: 1955). Here we are giving attention to two polyandrous groups who represent typically this system of marriage from very long past.

The polyandrous Todas of Nilgiri Hills in Southern India have long ago been studied in details by Rivers

(1906) and the polyandrous mating system among them has been pointed out to be completely organized. As soon as a woman marries a man, it is socially understood and accepted that she becomes the wife of his brothers at the same time. In vast majority cases the husbands are own brothers. In a few cases the husbands might be clan-brothers i.e., they belong to the same clan and are of the same generation.

Fraternal polyandry leads to the formation of a family with one married woman and more than one husbands who being related as brothers, live together. When the wife becomes pregnant, the eldest brother performs the ceremony of giving the bow and arrow to assure the prime responsibility of the newborn as 'social' father, though all the brothers as legal husbands are equally regarded as the fathers of the child. When a brother sets up a separate family—establishment of his own, he runs the risk of loosing his right to be respected as the father of the children born in a polyandrous family.

In non-fraternal polyandry husbands live usually at different villages and the usual rule is that the wife shall live with each husband in turn for a month at a time. When the wife becomes pregnant it is arranged that one of the husbands shall perform the ceremony of giving the bow and arrow. He who carries out this significant ceremony becomes the father of the child for all social purposes.

When own brothers are husbands to a woman at a time, the family formed by them has no difficulty to function as a single compact unit. By arrangement familial including sexual relations betwen the spouses is controlled in such manner that no child is left without a social recognition as an illegitimate birth. But when the husbands are residents of different villages the wife lives by rotation with each husband not in a single compact unit. Nevertheless, the role of a husband as a 'social father' is culturally approved in such a judicious manner that no child is identified as illegitimate member of the polyandrous society of the Todas.

It is also known that sex relations among the Todas are not confined to partners in marriage. One or more recognized lovers of a woman is not uncommon. Adultery is not socially punishable. Sex laxity is not merely tolerated but is socially approved so that a child who is born of the wife before she first comes to stay with her husband is accepted by him. Ordinarily in a community that condones laxity in sexual life paternity is foisted upon the legal husband of the mother of the child (Kapadia: 1955). More details about marriage system, family formation and kinship organisation are readily available from Rivers (1906) and we are not going to discuss here the same in further details.

In the specific sociocultural context of the Toda society the need for family planning or birth control by any means cannot normally be felt by them. Infanticide was once prevalent among them (Pakrasi: 1964), yet acceptance of voluntary control of births does not hold it appears, still any prospect in the polyandrous society of the Todas.

It has already been pointed out that over a large area of the Himalayan regions both trans-Himalayan and cis-Himalayan, it is customary for a man to share his wife or wives with his brothers. This fraternal polyandry is distinguished from matriarchal polyandry which was once commonly practised in Malabar, South India, where husband of a woman were not necessarily related to one another by kinship or by consanguinity (Majumdar: 1962). By the system of fraternal polyandry the wife comes to live as in the Todas, with the group of husbands in their houses, but for matriarchal, polyandry she remains in her own house and her husband or husbands come to live by turn as irregular visitors. Thus, through the system of polyandrous marriage the formation of family happens to follow two distinct courses-one is governed by the patriarchal customs, while the other is controlled by the matriarchal customs.

In his extensive anthropological study of Khasas, a polyandrous group of Jaunsar Bawar Pargana, Dehra Dun District and Tehri of northern Himalayan region Majumder has remarked that a family among them forms a domestic unit, with patrilocal residence, patrilineal descent, and patriarchal authority. Among them marriage is secular and contractual. Further, the domestic unit often offers the form of a joint family which is a union of all male members of all living generations, in the patrilineal line of descent, along with their wives. But for the very system of marriage the polyandrous family of the region differs from that of other parts of Uttar Pradesh. Here the nuclear family is not as stable as is found normally in monogamous society, the wives are not permanent members of the family. It is a very common practice for the wives to go back to their respective parental family during festivals and other occasions and divorce is observed to be very frequent and seldom a wife remains in husband's family for many years together.

Formation of family is effected by the polyandrous people in such a manner that their family system has turned out to be not only polyandrous but a combination of paternal polyandry and polygyny. In principle and in practice, all the brothers-adult or minor-constitute a compact entity as fraternal husbands under the control of the eldest brother. The wives come individually one after another to join the compact entity of husbands, in the same way as is usually witnessed in the polygynous system, except that the single husband is replaced by the polyandrous group of husbands. On the other hand, among the Khasas after a man's death his widow is generally appropriated by his brother who does not follow polyandrous system. For this reason adultery with a brother-in-law is often condoned. Additionally, no bride price is involved in such arrangement of *levirate*-marriage.

The wife married by any one brother becomes automatically the sexual partner of all brothers and as such the wife as well as the children remain common to all brothers. The eldest brother is recognised as the 'social' father of all children born to polyandrous or polygynandrous unions. Senior most woman in the family, usually the first wife of the senior male mem-

ber, is more respected among all *ryantis* (wives) though all other wives have equal status. But it is significant that those *ryantis* who have proved their fertility are more favoured by the husbands. Depending upon economic condition often additional wives are also taken for begetting children. Children are assets to a polyandrous family and they are loved by all their fathers as well as by their mothers and stepmothers.

Polyandrous society in the Himalayas region is observed to tolerate liberally a double standard of morality, in which patriarchal code is insisted on *ryantis* (wives) but the daughters (*dhyantis*) are allowed inordinate latitude and license. The wives migrate periodically to their parental villages where they as *dhyantis* have no restraint to take the liberty of a more relaxed life. Sometimes, a *ryanti* does return as a pregnant woman from her father's house and the child she delivers is accepted as legitimate as the others.

It has been remarked that due to a peculiar geo-economic setting the complicated processes of the formation of family-polynandrous are in operation among the polyandrous people of the Himalayas. In general, the conjugal relations between husbands and wives are cordial in the family, though each spouse is always on guard against the other, lest his or her partner goes to clandestine paramours. As *ryanti* adultery of a wife in her husband's village is a matter of grave consequences, but her extra-marital affairs as *dhyanti* at her father's house is never considered a serious crime.

In the aspect of widow remarriage in the polyandrous society we find that a widow should not essentially remarry if she prefers to live in her deceased husband's house and invite her brother-in-law or any other person to live with her. The son begotten by a brother-in-law in a widow's house is regarded as the son of the deceased. Even the widow can live with a stranger as 'wife' and begets children but these children are regarded as those of her deceased husband. Thus, a widow is free either to marry or not, and to marry anyone she likes (Kapadia 1955). There seems to exist in polyandrous society some sort of social disapproval in recognising the union of a widow with a stranger and their children as a family, yet procreation of such babies is given due recognition. Under the circumstances, how the same society can be anxious to control fertility and family size in contravention of strong craving for children among the parents of polyandrous society?

There is another aspect of the polyandrous people of the Himalayas. A man born without a brother shall have to go for monogamous marriage or polygynous unions. Marriage statistics collected from among the khanasa polyandrous group show that the families formed through polyandrous unions existed in majority cases. Such composite unions were followed by polyandrous unions, though monogamous families were formed in almost equal strength to that of polyandrous families.

General craving for children among the Himalayan polyandrous people is extremely high and hence, a woman after proving her fertility is considered more desirable than she was before. In this context the motive for family planning can not, of course, strike very advantageously its root in the polyandrous couples of the Himalayas.

In this context the importance of the group of 'avunculates' (maternal kin or *maula*) in polyandrous society has to be taken into consideration. Importance of this specific kingroup persists due to its connection with the family instead of the person. The mother acts as the vital link between a man and his *maula*. Divorce is frequent in polyandrous families. Remarriage of the divorcees occurs with equal frequency, so long as the strong desire for children remains a dominant issue with all families in general. Under the circumstances, unless a son is born to a wife the kinship integrity and continuity of the newborn with the *maula* cannot be achieved. The polyandrous people have therefore laid more emphasis on the group of maternal kin for upholding social identity of the newborns. Since biological paternity is less valued than social fatherhood in polyandrous families where the eldest brother (husband) by dint of their cultural tradition is always regarded as the 'social' father of all children produced by the brothers in the family, the urge for family planning can hardly thrive in this particular sociocultural situation. Nevertheless, changes and modifications, both in idea and action, are gradually setting in the family system of the Himalayan polyandrous people through cultural contacts, with the local non-polyandrous caste people and it may be expected that for such contacts with out-siders the motive for family planning might one day or other find its entry into the life and living of the hardworking, poor and simple polyandrous people of the northern Himalayas.

IV. Marriage System : Cross-cousin

This marriage system is an old trait of the vedic culture. References of the system are available from the ancient literature like *Rigveda, Satapatha Brahmana.*

But that this particular form of marriage was rare in Brahminic tradition is also mentioned (Kapadia: 1955). Out side the 'middle region' of India the outlandic Indo-Aryan peoples have been reported to continue to marry cross-cousins, preponderately the mother's brother's daughter. Still later and in recent and contemporary times the prevalence of such matings among the speakers of Indo-Aryan languages has gradually become very sporadic except amongst the-Marathi-speaking peoples amongst whom it is still practised by many (Mukherjee et al: 1980). In some cases cross-cousin marriage is involved with inheritance passing to a sister's son, in some it is effected to cement social ties and affection between brother and sister. Cross-cousin marriage is said to be a characteristic feature of the Dravidian peoples.

Whatever might be the precise sociocultural reasons for approving one's marriage with mother's brother's daughter (MBD) it is also a historical fact that parallel-cousin marriage is not uncommon in the country.

As a matter of fact, four kinds or first cousin marriages are frequently met with all religious communities and tribes in India. The Hindus prefer more to practise cross-cousin marriage with MBD than with father's sister's daughter (FSD), whereas both cross and parallel cousin marriages are prevalent among the Muslims. Moreover, marriage with elder sister's daugher is a common kind of uncle-niece marriage in the country, especially among the Hindus in Andhra Pradesh, Karnataka, Tamil Nadu and Pondicherry. Thus, it is evident that consanguineous marriage is more prevalent in southern than northern India.

Recent profile of consanguineous marriages in India as is available on the basis of 1961 Census data from the Monograph published from the office of the Registrar General (1974), has meanwhile been well highlighted to indicate that (a) consanguineous marriage among the Hindus is confined mainly in Southern India, (b) the Muslims both in the North and in the South practise such marirages. (c) the most frequent type of consanguineous marriage for all religious communities and tribes in India is that between first cousin, (d) the Buddhists practise both cross and parallel cousin marriages in Tripura, but they marry only mother's brother's daughter in Arunachal (Roychoudhury: 1976). Cross cousin marriages are common in a good number of tribal people of the country.

Let us look in to the system more closely now. The types of preferential mating which are found over the vast area of South India offer still a representative profile of this age-old custom of selection of mate and family formation (Karve: 1961). (1) In a large number of castes the first preference is given by a man choosing his elder sister's daughter as a bride. Marriages of this kind are legion. A man's elder sister is given in marriage to a family and which in turn gives rise to a social obligation. Due to this obligation the family of the married man has to marry his daughter to the family from which he had originally received the bride. The right or obligation of a man to marry his elder sister's daughter is felt very keenly, but among non-brahmin castes there is a taboo against a man's marriage with the younger sister's daughter. The marriage of a woman to her maternal uncle is taboo among all matrilineal communities of South India.

(2) Another type of preferential marriage is the custom of a man's marriage with his father's sister's daughter, i.e., a woman marrying her mother's brother's son. This form of marriage is not uncommon among a very large number of castes of Southern India. In the above two systems there is the principle of return. The family which offers a daughter expects one in return. Sometimes exchange of daughters in the same generation is also effected.

(3) The third type of preferential mating is that of man with his maternal uncle's daughter.

Formation of family through preferential mating as is found among many tribes and Hindu castes of India, is socially approved to strengthen kinship solidarity and economic integrity among the inter-marrying families. It has been argued by the social anthropologists that cross-cousin marriages have been practised quite extensively as a very judicious device for avoiding payment of a high bride price and also for preserving property in the household.

The preferential marriage custom of Southern India has a very vital, social obligation linked with the *principle of return*. This principle is forth with interlaced with the very kinship organization and family ties of the people concerned. Any violation of the obligation and other socio-economic advantages of preferential mating is apt to generate tension and conflict with the social structure that has been for centuries together nurtuing the marriage as well as family system in question. For such violation formation of family of procreation by the people is bound to be seriously disrupted. Keeping these consequences in mind one has to advocate family planning very cautiously for the people prefering cross-cousin marriages. But for this principle of return the marriageable cross-cousins must first be assured by the families concerned to upheld kinship stability and economic solidarity and until this fundamental familial requirements are fulfilled the couples formed through preferential mating can, it is believed, hardly be motivated for family planning. In spite of ever-growing number of population and continuing high birth-rate in the country the customary practice of preferential mating has not lost its significance in the society of the people who follow this marriage system. Now in the face of current staggering increase in population and high fertility in India how the emergency cultural need for family planning can be integrated with their total social needs for procreation, family formation and continuity of family line? Precise answer is still not known. Among the Muslims, marriage with father's brother's daughter is more or less obligatory. It is considered an insult, and in certain measure a social offence, to refuse to accept one's father's brother's daughter in marriage. In the polygynous family of a Muslim she is given the honour of the principle wife, irrespective of age or period of marriage. Through this specific marriage system the Muslim law-givers find a judicious means to contribute to family solidarity. A specific share in the family property has been assigned to daughters and other females. Dower (Mahr) is obsolutely the property of the wife. On her marriage outside the family this property of the woman would pass to another family. And hence, to do away once for all with this eventuality the marriage with a father's brother's daughter has been championed by the Muslims in preserving the family asset within the family.

It has already been noted that the exogamic rules relating to the Hindu marriage have very strongly prescribed that no man shall marry a maiden from within his clan (gotra). The fear of giving birth to defective progeny appears to dominate such prohibition. It is wellknown that the union of man and woman closely related by blood ties is a union of similar hereditary (genetic) traits. Now if the closely related couples carry some undesirable traits or others from their ancestry, the offsprings are likely to be

doubly the sufferers for it. It may happen that some undesirable trait which is recessive can be manifested in the offspring because of the "double dose" in case of consanguineous marriages (Prabhu: 1954).

Consanguineous marriages reduce the frequency of heterozygotes in the population and distribute them equally to the two homozygotes. The inbreeding effect is most pronounced on homozygotes which are determined by very rare genes. Studies have been made comparing the effects in children of unrelated and consanguineous parents to reveal that the rates of morbidity and mortality are increased in offsprings of the consanguineous as compared to those of unrelated parents (Dronamraju & Khan: 1963; Neel: 1958; Report: 1962; Centerwall and Centralwall: 1966; Sushil Kumar et al: 1967; and Rao & Mukherjee: 1975). But there are reports which do not tally with the above finding (Sanghvi: 1966; Rao & Inbaraj: 1977; Line delius: 1980). That consanguineous marriage runs a genetic risk for the newborns cannot be fully and wholly rejected. In the formation of family through cross-cousin marriages due attention on the genetic side of the connubial partners is essential and this issue may constitute an important dimension of family planning practices of the couples concerned.

V. Concluding Remark

Assessment of that impact of marriage systems on family planning in India is really a hard proposition. Society has taken centuries to organize and enact a particular system in sustaining dynamic kinship organisations in the very interest of the constituent members. These members do form certain groups small or big with some characteristics and problems. Yet, the first and most immediate social experience of mankind is small group experience (Homans: 1959). Such small group experience has its origin and development within the smallest unit of the society, namely, family, in strengthening multi-dimensional experiences about the larger social organization. Without marriage the very foundation of family can never be built up to help grow small group experiences of any individual. These experiences are essential not only to shape and control individual behaviour within and outside family but also to comprehend the *norm* of social behaviour.

As a *social being* no individual can ever surpass the dictum of the society and naturally in the arena of social behaviour (including sex behaviour) every responsible member of a family and/or society has to act in a manner which must strike a healthy balance between individual and familial interests. The importance of social intercourse in learning and enacting the prevailing codes of conduct of the larger kin or social organization is paramount for every individual as one of many intersecting members. This is all the more true in the stratified society of the country. The family as a 'natural' group (Sprott: 1958) emerges out of the process of having and caring for children. This universal group acts as the custodian as well as the preceptor of customary ways of doing things and norms of behaviour which each member must follow in all kinds of sociocultural (including procreative activities). Intrinsic nature of the Indian families confirms the reality of these two functions of the universal group.

Family and its near kingroups act generally within a well defined network of mutual relationships in such manner that social duties and privileges which are thought to be beneficial to the group as a whole can be handed down judiciously to each constituent members for their guidance and action. Any infringement that may threaten stability and continuity of this network of relationship by a socially disapproved or undesired behaviour shall, no doubt, immediately be resisted, if not punished. This is all the more true in the event for setting up a connubial relation and founding a family of procreation (Pakrasi: 1982).

Again, in the tradition-bound agrarian society of the country the married couples, especially younger ones, are still not normally allowed by the family elders to exercise their individual right and discretion, irrespective of marriage system, in building up family of procreation. The newly married couples remain for a considerable length of time under the effective control of the parents and other senior kin. Cultural expectations and decisions of the family elders, especially the mother-in-laws of the female spouses, exert enormous influence on the social behaviour (including reproductive behaviour) of the newly-wed couples. Under the circumstances, until the family elders become sufficiently convinced about the significance of the currently-emerging social need of family planning the traditional mode of family formation shall continue moreover, the traditional, customary doctrines about *why* and *how* a family should be founded in the very interest of the society as a whole, are bound to overshadow heavily the prospect of a new kind of procreative behaviour due family planning activities. Concept of family planning is innovatory in character and it is powerful enough to generate induced changes in sex and procreative behaviour of the married couples. But this concept has yet to identify itself fully with the *societal consensus* that governs or prefer, irrespective of marriage pattern, a desirable number of children per family (Raman & Pakrasi: 1980).

Thus, it is reiterated that as reproductive behaviour and family building motives of the married couples are not a matter of only legislation and dictation these couples have to depend, whether they like or not, upon the currently prevailing *norms* of family building and living in their kinship (social) organization, upon the existing institutions like marriage, family and religion for their respective welfare, security and progress. One cannot forget that human beings do not live, much less reproduce, apart from society (Davis: 1967). There exists always a dynamic reciprocal relation between social structure (including family groups) and population (fertility outcomes) and the social structure influences, irrespective of marriage system, population changes as well as is affected by population size (Bottomore: 1962). Eventually in this context, one has to understand the nature of interrelationship between family and fertility in assessing how monogamous marriage and fertility get socially controlled (Pakrasi & Malaker: 1967; Nag: 1965).

Let us now look into another dimension of the question of family planning vis-a-vis family formation by a particular mating pattern within monogamous or polygamous system. The Indian society is still facing high infant mortality and the upshot is that the parents have logically developed a conviction in tune with their immediate family elders that they need to give birth to five or more children to be sure that two or three of them would survive. In addition, many families desire two surviving sons. It has officially been urged that efforts should vigorously be made to help reduce the incidences of maternal and neonatal or post-natal mortality. It is also admitted that out of every 20 children (born in 1980) in developing countries like India three were going to die before the year was over and one more would die before his/her fifth birthday. Of the 16 out of 20 who would survive three or four can look forward to severe malnutrition at sometime during early childhood (Centre Calling: 1980).

In the above situation it is quite understandable why many couples do not feel interested to go for birth control to limit family size until they have sons or until they can be assured that sons and daughters will survive. Here lies the *key* issue: reduce high infant mortality and protect surviving infants and thereby ensure desirable decline in family size through family planning measures. In every marriage system monogamous or polygamous—cardinal emphasis is all along on the procreation of children and no mandatory dictum has clearly been ever spelt out to indicate how many children a married couple should produce. Rather the childless wives face still social reproach familial reprove and conjugal contention. Moreover, if the birth of first child is delayed beyond a reasonable time the newly married girls are often exposed to disparaging remarks and murmuring censure within the family and its near kin circle. Eventually no young wives should want to run the risk of being branded as infertile woman by delaying child birth through family planning measures.

Reliable information about the impact of marriage system on family planning is hardly available in the country and as such what one may infer has to be sifted from within the complex customary rules and regulations enjoined by the Books of laws for guiding the codes of conduct in founding a successful family of procreation through a socially-approved monogamous or polygamous marriage.

We agree with the statement that argues that the population problem in India would have been very different if the social institutions of early marriage, universality of marriage, the social ban on widow remarriage and the Hindu joint family and other institutions and attitudes resulting in a high birth rate and a sex ratio in favour of males did not exist for generations together. But these institutions with a socio-religious tradition and cultural sanction behind them exist and condition the family and societal lives of an overwhelming majority of the people in the country (Chandrasekhar: 1961). The Muslims, Tribes and other communities could not escape, of course, strong impact of all the socio-cultural developments which took place among the numerically strongest group of the Hindus. Naturally in the examination of the question of the impact of marriage system on family formation and family planning one cannot but enquire seriously into the prime *ethics* that continue to govern within the tradition-oriented society the socio-psychological attitudes and ideals of Indian parents towards marriage, family, procreation and continuity of kinship cohesion.

Illiterate and poor people of the agrarian society of India are steadfastly following their own logic and sense of security to adhere to their own *dharma* (rules of conduct) in covering the whole field of social behaviour within and outside family group. They are to integrate their thinking and understanding with the prevailing customs, beliefs, folkways and sentiments of the local society. In doing so they learn to nourish the life-aspirations with respect to marriage and family formation and its future structural setting (Pakrasi: 1966). In this context, the importance of family planning behaviour as a *new code of conduct* in sex and reproductive life can be realised by the people at that time only when the new code becomes an integrated component of the said *dharma*.

The basic need for founding a family is universally acknowledged to be connected essentially with procreation of children. Sex and reproductive behaviour is so complexly regulated as well as promoted through varying marriage rules in different societies that the jural tenets governing marriage cannot obviously be ascertained by reference to codes laid down by a State. Such behaviour must be understood from the study of the recurrent patterns of marriage developed in harmony with folk model. Cultural expectations pertaining to the institutions of marriage and family-building have to be carefully evaluated since what common folk value or disvalue, what goals they generally agree upon, what they consider normative and what they judge as good or beneficial and bad or risky within and outside the boundary-limits of their families/kingroups shall always be the decisive factors (Marshall: 1968).

Under the circumstances we have to keep an open and receptive mind to forge in consonance with National Population Policy a congruence between the innovatory move aiming at a *new behaviour pattern* related to late marriage and small family and the pattern of customary connubial and procreative behaviour of the people in the stratified society of India (Pakrasi: 1967, 1974, 1975).

Lastly, it is noted that effective control of the present trend of population increase in India lies in the final analysis on *social decisions* of the people (Pakrasi: 1979) and accordingly systematic anthropological investigations into all the currently prevailing social prerogatives for and experiences of marital unions and family-formation in different cultural groups (community/caste/tribe) are no doubt essential. The very socio-cultural motives and understanding linked with the act of begetting a child on the part of

the vast multitude of poor, illiterate couples who still adhere strongly to the traditional form of corporate group living in a larger kinship nexus (Lorimer: 1954) have to be appreciated first and then and then only the significance of an age-old marriage system and its impact on family formation can be better appreciated.

References

Agarwala, S.N. (1967) : Effect of a rise in female marriage age on birth rate in India—in the *Proceedings* of the UN World Population Conference, II, New York.

Bottomore, T.B. (1962) : *Sociology ; A Guide to Problems and Literature* (George Allen and Unwin Ltd., London) p. 80.

Census of India (1951) : INDIA, Vol. I, Pt I-A (*Report*), p.74-75.

Census of India (1961) : *Marriages with Consanguineous and Affinal Relations* (office of the Registrar General, New Delhi, 1974)—a Mimeographed document.

Centre Calling (1980); XV, Nos. 11-12, p. 10 (Deptt· of Family Welfare, Govt. of India, New Delhi).

Centerwall, A.R. and S.A. Centerwall (1969) : Consanguinity and Congenital Anomalies in South India : A Pilot Study—*India. Jour. Med. Res.*, 54, 1160—1167.

Chandrasekhar, S. (1959) : *Infant Mortality in India* : 1901-55 (George Allen & Unwin)

Chandrasekhar, S. (1961): *Population and Planned Parenthood in India*, 2nd. edition (George Allen and Unwin, London), chp. 7.

Das, N.C. (1967) : A Note on the effect of postponement of marriage on fertility—in the Proceedings of the U.N. World Population Conference, II, New York.

Davis, Kingsley (1967) : *Human Society* (Macmillan Co., New York).

Davis, Kingsley (1951) : *The Population of India and Pakistan* (Princeton Univ. press) p. 79—81.

Dronamraju, K.R. and P. Meera Khan (1963) : The Frequency and Effects of Consanguineous marriages in Andhra Pradesh—*Jour. of Genetics*, 58, 387—401.

Friedl. J (1976) : *Cultural Anthropology* (Harper's College Press, New York).

Ghurye, G.S. (1961) : *Caste, Class and Occupation* (Popular Book Depot, Bombay).

Gillin, G.E. and J.P. Gillin (1942) : *An Introduction to Sociology* (The Macmillan Co.)

Hawthorn, Geoffrey (1970) : *The Sociology of Fertility* (Collier—Macmillan Ltd., Lond.)

Homdus, G.O. (1959) : *The Human Group* (Routledge & Kegan Paul Ltd., Lond.) Imperial Gazetteer of India, Vol. 1 (new edition), 1907 (The Clarendon Press Oxford).

Kapadia, K.M. (1955) : *Marriage and Family in India* (Oxford Univ. Press, London).

Karve, I (1965) : *Kinship Organization in India*—2nd rev. edition (Asia Publication House, Bombay).

Khan, M.Z. (1962) : *Islam:Its Meaning for Modern Man* (Routledge & Kegan Paul, Lond.)

Kirk, Dudley (1965) : Factors Affecting Molem Natality—the paper presented in the International Conference on Family Planning Programs, Geneva, August 23—27.

Linedelius, Rolf (1980) : Effects of Parental Consanguinity on Mortality and Reproductive Function. *Hum. Heredity*, 30, 185—191.

Lorimer, Frank (1954) : *Culture and Humam Fertility* (UNESCO), p. 100.

MacIver, R.N. and C. Page (1949) : *Society: An Introductory Analysis* (Macmillan, Lond.).

Majumdar, D.N. (1962) : *Himalayan Polyandry* (Asia Publishing House, Bombay).

Marshall, G.A. (1968) : 'Comparative Analysis' in David L. Sills (Ed.) International Encyelopaedia of the Social Sciences, 10, p. 8.

Ministry of Law, Govt. of India (1956) : *Acts of Parliament*, 1955, p. 153—162.

Mukherjee, B.N., K.C. Malhotra, Kanti Pakrasi and S.L. Kate (1980) : Inbreeding, village endogamy and marriage distances : Spertial temporal and social variation. HOMO, 31, 21—38.

Nag, Moni (1965):Family Type and Fertility—the paper submitted to the U.N. World Population Conference, Belgrade (Reprinted in *Biosocial Studies in India* edited by Kanti Pakrasi et al. Editions Indian, Calcutta, 1976).

Neel, J.V (1958) : A Study of Major Congenital Defects in Japanese Infants *Ame. Jour. Hum. Genet.*, 10, 398-445.

Pakrasi, Kanti (1964): A Note on Differential Sex ratio and Polyandrous People in India—*Man in India*, 44, 2, 161—174.

Pakrasi, Kanti (1966) : On Some Social Aspects of Fertility and Family in India. The Indian *Jour. of Social work*, 27, 2, 153—162.

Pakrasi, Kanti (1967) : On Certain social issues relevant to Family Planning in India—*Bulletin of the Cultural Research Institute*, 6 (1 &12), 78—85.

Pakrasi, Kanti (1974), :World Population Year 1974 and the Peoples of India—*Science and Culture*, 40, 8, 340—348.

Pakrasi, Kanti (1975) : Fertility and Population Problems in India : A Biosocial Study—*Jour. Indian Anthrop. Soc.*, 10, 181—194.

Pakrasi, Kanti (1979) On some Aspects of Population Problem—*Man and Life*, 5, 3 & 4, 146—153.

Pakrasi, Kanti (1982) : On some Biosocial Factors related to Population Control Planning—the *Proceedings* of the Seminar on Population Control Planning held at Indian Statistical Institute, Calcutta, 26 March, 1982.

Pakrasi, Kanti and Ajit Halder (1970) : Polygynists of Urban India, 1960-61 *The Indian Jour. Soc. Work*, 31, 1, 49—62.

Pakrasi, Kanti and A. Halder (1971) : Fertility of Polygynous Couples in India—*HOMO*, 22, 3, 189-203.

Pakrasi, Kanti and C.R. Malaker (1967) : The Relationship Between Family Type and Fertility—*Milbank Memorial* Fund Quarterly, XIV, 4, 451—459.

Pakrasi, Kanti and C.R. Malaker (1979) : Marriage and Population Policy in India—*J. Indian anthrop. Soc.*, 14, 95—106.

Prabhu, P.N. (1954) : *Hindu Social Organization*—New rev. edition (Popular Book Depot, Bombay).

Raman, M.V. and Kanti and Pakrasi (1980) : Ideal Family Size, Sex Preference for children, and contraceptive practice by women wanting no more children. A Calcutta Study in Kanti Pakrasi, A.R. Banerjee and A.K. Halder (Eds.). *The Calcutta Couples*: A Biosocial Profile (Editions Indian, Calcutta), p. 126—159.

Rao, A.P. and D.P. Mukherjee (1975): Consanguinity and Inbreeding Effects on Fertility, Mortality and Morbidity in a small Population of Tirupati *Proceedings* of Ind. Soc. Hum. Genet—second annual conference, Calcutta.

Rao, P.S.S. and S.G. Inbaraj (1977) : Inbreeding effects on human reproduction in Tamil Nadu—*Ann. Hum. Genet.*, 41, 87—98.

Report of the U.N. Scientific Commission on the effects of Atomic Radiation (1962) : Quoted by L.D. Sanghvi in 'Inbreeding in rural areas of Andhra Pradesh'—*Ind. Jr. Genet.*, 26A (Symposium Number), 1966, 351-365.

Rivers, W.H.R. (1906) : *The Todas* (Macmillan & Co. Ltd. London).

Roychoudhury, A.K. (1976) : Incidence of Inbreeding in different States of India—*Demography India*, 5, 108—119.

Sarkar, B.N. (1970) : Studies on Age at First Marriage in India—in *Biosocial Studies of India* edited by Kanti Pakrasi, A.R. Banerjee and A.K. Das (Edition Indian, Calcutta).

Sanghvi, L.D. (1966) : Inbreeding in rural areas of Andhra Pradesh—*Ind. Jour. Genet.*, 26A (Symposium Number), 351—365.

Sastri, K.A.N. (1955) : *A History of South India from Prehistoric* times *to the fall of Vijaynagar* (Oxford Univ., Press., Madras).

Schieffellin, Olivia (Ed.) (1967) : Muslim Attitudes Towards Family Planning (The Population Council, New York).

Seligman, E.R.A. (1948) : *Encyclopedia of the Social Sciences*, Vol. 9, 149-150.

Sprott, W O.H. (1958): *Human Groups* (Penguin Books).

Sushil Kumar, R.A. Pai and M.S. Swaminathan (1967) : Consanguineous marriages and the genetic load due to lethal genes in Kerala—*Ann. Hum. Genet.*, 31, 141—147.

Valavalkar, P.H. (1939) : *Hindu Social Organization*, Chap. 4, 192—194 (Longmans, Green & Co., Ltd., Bombay).

Westermarck, E. (1894) : *The History of Human Marriage* (Macmilian and Co., Ltd., London).

PAPERS OF SESSION VI

ON THE RELATIONSHIP BETWEEN LANDHOLDING AND FERTILITY

MEAD CAIN

A number of recent studies have highlighted the relationship between landholding and marital fertility in rural areas of developing countries. Mueller and Short, in their review of the effects of income and wealth on demand for children for the National Academy of Sciences Panel on Determinants of Fertility in Developing Countries, note the consistency in empirical studies of the positive relationship between land owned or operated per family and fertility.[1] This "striking consistency" is also given prominent play in the summary essay on demand for children prepared for the NAS Panel by Lee and Bulatao.[2] Another substantial body of research, sponsored by the Pennsylvania State Agricultural-Demographic Project, has given special attention to the implications of the relationship for the design of agricultural and rural development policy.[3] Interpretations of the substantive and theoretical significance of the land-fertility relationship vary. (Indeed, the Penn State research disputes the sign of relationship, arguing that size of operational holdings has a positive fertility effect, while size of ownership holdings exerts a negative influence on fertility.) The NAS Panel, for example, gives weight to the possibility that the positive relationship reflects a pure income effect,[4] while the work of the Penn State group emphasizes the economic value of children (the complementarity of child labor and landholdings underlies the positive relationship between farm size and fertility, and the substitution of land for children as a security asset underline the negative relationship between and owned and fertility). Despite differences in interpretation, however, the research just cited, and the great majority of other research on the topic, regard differentials in fertility by landholding status at the household level as reflecting purposive, optimizing reproductive behaviour based on differential demand for children and the psychic, social, and/or economic services they provide to parents.

This paper discusses several methodological issues raised by this research that bear on the interpretation of the estimated effects of various measures of landholding on fertility. The analysis suggests the importance of considering land tenure systems in interpreting the relationship and cautions against automatically assuming that purposive reproductive behaviour generates the observed fertility differentials. In some cases the differentials are quite likely indirect, unintended (and, probably, unnoticed) consequences of other behavioural patterns associated with landholding status. An alternative way of thinking about land and fertility is introduced, one that views children as a security asset that complements, rather than substitutes for, land.

The Land-Security Hypothesis

A novel proposition that has emerged from the research of the Penn State Agricultural-Demographic Project is that access to land has two major dimensions that influence fertility in opposite directions. This proposition rests on the distinction between operational holdings (area cultivated by a farm family, which may include land taken in under various rent or sharecropping arrangements and exclude owned land rented out) and ownership holdings. The size of operational holdings, it is suggested, affects fertility by "altering the cost-benefit evaluation of the value of additional children," so that "farm families with access to larger holdings are able to use additional family labor more profitably[5]. I will refer to this as the land-labor demand hypothesis. Ownership and operation of land entails, in addition to the returns to labor and management accruing to cultivators of rented land, an equity return. Hence, it is argued, "land ownership should reduce the importance of children as sources of parental security in old age and contribute to lower fertility."[6] In the discussion below I refer to this as the land-security hypothesis.

We turn first to the land-security hypothesis, the reasoning behind it, and the analysis that has been employed to test it. Table 1 reproduces the results of several regression equations that represent the primary evidence in support of the land-security hypothesis. The dependent variable, children ever born, is regressed against farm size, a measure of land ownership, income, wife's education, age, and age at first marriage, for samples of households in rural Thailand and Egypt. As the table indicates, the regression co-efficient for the variable labelled "land ownership" is negative and statistically significant. This is taken by the Penn State Group as evidence in support of the hypothesis.

Table 1 : Regression Analysis of Fertility (Children Ever Born) in Rural Thailand and Egypt

Variables	Standardized Betas	
	Thailand	Egypt
Farm size	0.0476 (1.74)*	0.0571 (1.47)
Land ownership	—0.0814 (2.97)	—0.0858 (4.02)
Income	0.0149 (0.540)	—0.0301 (0.79)
Wife's education	—0.0316 (1.15)	0.0319 (1.51)
Wife's age	0.6358 (22.37)	0.7714 (36.32)
Wife's age at first marriage	—0.3351 (2.07)	—0.2223 (10.57)
N	775	851
R^2	0.44	0.63

*Student value.

Source: Schutjer and Stokes, "The human fertility implications..... *loc. cit.*, in footnote 3, p. 9.

48—5 RGI/ND/84

There appear to be a number of flaws in this analysis. The first relates to the operationalization of land ownership. For reasons that are not entirely clear (but perhaps because of a high correlation between farm size and ownership holdings), the measure used in the equations in Table 1 is land owned and operated as a proportion of total operational holdings. A relatively minor difficulty with this variable is that it would seem to exclude land owned that is rented or leased to others. This exclusion would result, for example, in the classification of those who lease out all their land as "landless" -- they would score zero on both farm size and "land ownership," as measured. Of greater importance is the variable's ambiguity and its questionable correspondence to the concept that is of theoretical interest. Regarding the latter, surely it is the size of ownership holdings, rather than the proportion, that is relevant. One acre of owned land yields the same potential stream of income and security (discounting any farm size productivity differences) regardless of whether it represents 100 or one per cent of operational holdings.

The ambiguity inherent in the variable needs some elaboration. Land owned and operated as a proportion of total operational holdings is equivalent to one minus land leased in as a proportion of total operational holdings. Viewed in this way, the results reported in Table 1 can be read as either: an increasing proportion of land owned is associated with lower cumulative fertility; or, a decreasing proportion of land rented is associated with lower cumulative fertility. I would suggest that the latter is more readily interpretable than the former, particularly in light of the poor correspondence between proportions owned and size of ownership holdings.

Note that the dependent variable in Table 1 is children ever born — a measure of cumulative fertility, not current fertility. If one views children ever born as a rough proxy for current household labor force, and makes reasonable assumptions about the rental market for land in Thailand and Egypt, then the negative co-efficient for "land ownership" in Table 1 can be interpreted as reflecting the adjustment of households to resource endowment: households that are well endowed with labor tend to augment ownership holdings with leased land, while households that are labor deficient lease land to others. (Concurrently, consumption requirements may induce larger households to bid for more land.) If this is the case, the direction of causation would be from size of household labor force (proxied here by children ever born) to position in the land rental market (here measured by proportion of operational holdings owned), not, as the Penn State Group would have it, from "ownership holdings" to fertility.

The assumptions that one must make about the rental market for land are that such a market really exists, that there is relatively free entry, and that terms of contract are sufficiently flexible to permit short-term adjustment to the changing resource position of households. Are these realistic assumptions? The image of relatively active and competitive land-rental market conflicts with a common conception of tenancy in developing countries — the conception of tenancy as an exploitative feudal institution. The evidence suggests, however, that for many developing countries this conception is outdated and inaccurate. While it may have represented a reasonable description prior to World War II and the emergence of developing countries as independent states, tenancy appears to have undergone profound transformation over the last four decades, under the pressure of land reform legislation, rapidly increasing population density, increasing population mobility, and technological advances in agriculture. For many areas, this transformation has produced conditions closely resembling those of our assumption above.

Research in India, for example, supports this view. A study of tenancy in Maharashtra and Andhra Pradesh found the tenant class to be heterogeneous, with relatively large owners represented equally with small owners; terms of tenancy are highly flexible with a typical period of lease of one year or less, and resource adjustment is the most important reason for leasing in the majority of cases — adjustment to the availability or non-availability of draught animals and human labor.[7]

I found conditions similar to these in the area of rural Bangladesh that I studied.[8] There, sharecropping is the exclusive form of contract; short-term contracts are the rule; there are very few pure tenants; and both large and small farmers are active in the market as lessors and lessees. There, also, adjustment to resource endowment is an important reason for entering the rental market. The regression analysis below serves as an illustration:

LEASE = 0.089 — .373 OWN + 5.97 LABOR
R^2 = .41
(.031)* (1.07) N = 229

Variable Definitions:
LEASE = Net acreage leased in or out (in tenths of an acre)
OWN = Arable land owned (in tenths of an acre)
LABOR = Males aged 12 to 65 years in the household

*Numbers in parentheses are standard errors.

For a sample of 229 households that either own or operate land, net acreage leased in or out is regressed against size of ownership holding and family labor force. The variables for both ownership holdings and family labor force are highly significant. The estimated co-efficient for LABOR implies that the presence of an additional male worker is associated with an increment of six tenths of an acre of rented land — a sizeable increment considering that the average amount of land owned for this sample is 2.9 acres.

Considering the problem of correspondence and the plausibility, for the reasons noted, of a positive relationship between size of family labor force and tenancy, it is difficult to accept the results in Table 1 as evidence in support of the land-security hypothesis either for the specific cases of Thailand and Egypt, or

more generally. Nor can one accept, on the basis of these results, such general conclusions as: "Agricultural policy and programs which [broaden] land ownership will likely exert downward pressure on desired family size among rural households through the substitution of land for children as a store of wealth."[9] It should be emphasized that these reservations do not call into question the hypothesis that high fertility is, in part, a consequence of the value of children as security assets. What is called into question is the notion that land is a good substitute for children as a source of security — good enough, that is, to yield either fertility differentials at the household level by size of ownership holding or change in fertility as a consequence of change in ownership holdings.

It is important to explore why land might not be a good substitute for children, inasmuch as, on the face of it, the notion does seem reasonable.[10] Both land and children can be seen to hold the potential of providing a "second best" annuity in rural settings where financial markets are poorly developed and social security systems do not exist. Despite this potential, however, children can be shown to be superior security investments in many cases, often because other markets are either underdeveloped or highly imperfect and because complementary social and legal institutions are weak. Land, for example, has to be managed in order to yield an income. This is true in most developing countries even if the land is leased out. Monitoring, supervising, and managing are labor-intensive, exacting, and costly activities. Neglect can threaten yields and income; and despite the existence of active labor markets in most developing countries, these are services that cannot usually be purchased. They must instead be provided by the owner or his immediate family.[11]

There is a host of amenities and necessary services that illustrate the desirability of receiving "annuity payments" in the form of labor, and that argue for the superiority of children as a security investment. (The labor in this case is more likely to be provided by a son's wife rather than a son.) A partial list might include health care, food preparation, running errands, and companionship. Although one could conceivably obtain some of these services in the market, even these would be highly imperfect substitutes for those provided by kin, and for many services there would be no substitutes at all.

One should also consider the security of the investment itself. It is from this perspective that the strongest economic argument in favor of children can be made. Agricultural yields vary from year to year under the best of circumstances; but under the worst, these variations can be extreme and cause serious interruptions in income streams. Prolonged flooding or drought can cause virtual suspension of production activity over large areas for extended periods. Conditions such as these will, of course, affect the incomes of owner-operators, tenants, and landlords alike, and thus rental income is no more protected than labor or management income. Unlike the situation in developed countries, there are few institutional mechanisms (such as commodity futures markets, capital markets, disaster insurance) in the developing world to help the farmer adjust to production-related fluctuations in income. Thus the integrity of ownership holdings is in doubt, and, as a great deal of evidence attests, adjustment to such fluctuations is often achieved through the distress sale of land. With the exception of those segments of rural society that have either great wealth or alternative, lucrative sources of income that are not subject to such risk, it is much easier to shed land assets than to accumulate them. Because catastrophe does not have an "up side" counterpart, there is typically little symmetry to the processes of gain and loss. This asymmetry is accentuated because, for the vast majority, the same failure of capital and insurance markets that hastens the loss of land impedes recovery and accumulation.

Weather-induced risk is only one of several sources that may directly or indirectly threaten the security of land assets. More direct threats include physical expropriation and fraudulent manipulation of land records and titles. A not inconsequential threat—or, at least, one that may be strongly perceived as such by land owners—is posed by the state, through land reform rhetoric or legislation.

Children, viewed as security assets by parents, are themselves not completely secure. There is, of course, the risk of mortality and debility—infant, child, and adult. Other kinds of "default" in the case of children include rejection of the parents and refusal to provide support, and the economic failure of children. Regarding the former, the leverage of inheritance would tend to discourage such behaviour.

Despite the risks entailed in investing in children as security assets, it is quite clear that they embody qualities that set them apart from land and for which there really are no substitutes. First among these is the quality of support they provide to parents, which is another way of acknowledging the central position of the family in develpoing societies, the labor intensity of all facets of home and market production, and the fact that life without family is barely worth living. Second is the versatility of children as security assets in settings where insecurity is rife and derives from many different sources, of which the process of aging is only one. Third, in many settings, the security of land itself is in doubt. And, while the store of wealth in land obviously provides some security, there are too many contingencies for which the sale of a fixed quantity of land would prove an inadequate buffer. As noted, such uncertainty requires something akin to an annuity, a requirement met by children.

This final point deserves emphasis. It suggests that it is more useful to think of land and children as security complements rather than substitutes. In the extreme, children can serve as an important means of insuring against loss of land. This is a point that I have argued in detail elsewhere for the case of Bangladesh.[12]

Before leaving the land-security hypothesis, I want to make one final point about the mode of analysis represented in Table 1. Implicit in this mode is a strong assumption about the stability in holdings over time. With a theoretical motivation that focuses on the potential trade-off of land and children as security assets, it makes no sense to specify such an empirical test without this assumption. The samples on which measurement of the variables of interest was taken are composed of heads of families (and their wives) distributed throughout the life cycle. On the other hand, the decision(s) involving fertility are concentrated at one end of the family life cycle (the early phase), while the period for which security is being planned is located at the other end. There is the presumption, therefore, in focusing on current ownership holdings as the explanatory variable, that parents had the same information when making their fertility decisions in the past (a point in time that would vary from household to household, and that they based these decisions on the assumption that they would have the same holdings at the time of "retirement." This may be a reasonable assumption in some settings, but clearly it is not in others. Certainly the change in ownership holdings experienced by households in the Bangladesh village that I studied has been dramatic. In a sample of 114 households from the village, of 91 heads of households who inherited some land, 20 had lost all of it and were landless by 1976. In an atmosphere of instability, with widespread evidence of personal misfortune and property loss, it seems highly unlikely that young parents would remain complacent about the security of their holdings in the future, or act as if these were secure.

Similar problems, I believe, exist for the land-labor demand hypothesis when the level of analysis in the household. In this case, however, the critical implicit assumptions concern the nature of tenancy in addition to the stability of ownership holdings.

The Land-Labor Demand Hypothesis

The land-labor demand hypothesis suggests, *ceteris paribus*, that as size of operational holding increases so do the opportunities for child employment and the returns to child labor; consequently demand for child labor should also increase and one should observe a positive relationship between marital fertility and farm size. While the statistical evidence that could in any way be regarded as support for the land-security hypothesis is exceedingly scarce, many studies, from a variety of countries, have yielded estimates of a positive relationship between fertility and operational holdings at the household level. These studies are all variants of the regression-analytic approach represented in Table 1, with a measure of fertility (usually children ever born) regressed on farm size plus additional explanatory or control variables. Can results such as these be interpreted as evidence in support of the land-labor demand hypothesis? The answer, in my view, depends on particular circumstances: in some cases, perhaps yes, but often—particularly in areas characterized by settled agriculture, private property rights, and active land and labor markets—the answer would be no. I will argue that one cannot venture any interpretation without first considering the local institutional arrangements governing land and labor and the rural nonagricultural employment situation.

As with ownership holdings in the case of the land-security hypothesis, there is here the assumption of stability in size of operational holdings over time. The logic of the specification in Table 1 is that land is given, to which fertility adjusts. This logic, and the implicit assumption that farm size remains constant over time, are doubtful for reasons elaborated in the previous section. Operational holdings are composed, in variable proportions, of land owned and operated and land leased in. The owned component is itself potentially subject to considerable chance plays in any individual's fertility experience, source of variation in a household's operational holdings over time, however, is more likely to be the rented component. The conditions of tenancy in Bangladesh and several areas of India were briefly described in the preceding section: allocation of land is achieved primarily through the market; period of lease tends to be of short duration; and the volume of transactions is high. One should not exaggerate the degree of change in individual holdings that these conditions might imply; nevertheless, there is unquestionably a good deal of fluidity to the situation—enough, one would think, to question the image of parents and prospective parents calculating (with some precision) their demand for child labor on the basis of current operational holdings and then translating the demand into actual fertility. (Regarding the latter, it is well to remember the large role that chance plays in any individual's fertility experience, even when plans are firm.) As was noted before, a common motivation for entering the rental market is adjustment to resource endowment; and for Bangladesh, size of family labor force was shown to be strongly related to position in the market. Under these circumstances, it might make more sense in cross-section analyses such as Table 1 to assume that family labor is the fixed input to which farm size adjusts, rather than the reverse. And, indeed, to the extent that children ever born reflect size of family labor force, some of the positive association that has been found between fertility and farm size may be explained in this way.

Assuming, for the sake of argument, that size of operational holdings remains fixed for individual families, it is still not clear at a given place and time that demand for child labor would vary significantly from household to household according to farm size, except under very particular circumstances. Crop production is nowhere the sole economic pursuit in rural areas of developing countries, and labor markets are not uncommon. Children are employed in many different ways, of which family crop production is only one. In rural Bangladesh, for example, these include gathering fuel, care of animals, petty commodity trading, fishing, crafts production, and a variety of forms of wage employment. In the presence of reasonably well-functioning labor markets,

moreover, one cannot claim that the returns to child labor in mainstream field activities such as harvesting and weeding are very much greater when employed on the family farm than when hired out to others. There are often perceptible advantages to using family labor: it can be employed at a slightly earlier age, and it entails lower supervision requirements, avoidance of potential cash flow problems in paying hired labor, and savings on other transaction costs incurred when hiring labor. However, it is unlikely that these advantages are sufficient to create decisive intergroup differences in opportunities or demand for child labor (sufficient, that is, to produce associated fertility differentials).[13] The following table compares the average hours per day spent in directly productive activities by male children from landless households and households that own 1.5 acres or more in a Bangladesh village:[14]

	Age		
	7—9	10—12	13—15
Landless . . .	2.2	8.1	10.1
Landowners (1.5 acres or more)	4.0	7.4	6.7

The early advantage in productive work time of the children of landowners is reversed with advancing age: by ages 13 to 15 the landless children hold a decisive edge.

On balance, then, I doubt whether the land-labor demand hypothesis serves as a general explanation for the widely observed positive relationship between size of landholdings and fertility. Similarly, I feel that the following kinds of policy conclusions should be greeted with some skepticism: "Development activities which increase the demand for child labor at the farm level (such as increasing farm size or irrigation) will contribute to the maintenance of a high level of desired family size by raising both the opportunity costs of child education and the family income contribution of children."[15] This is not to say that demand for child labor does not influence fertility behavior. What I question is whether, within a particular rural society or setting, parents' demand for child labor is primarily a function of their access to land. This is a poor assumption without much more information about institutional arrangements governing land, labor, and credit, and nonagricultural employment opportunities. It would seem to me that a search for important sources of variation in demand for child labor should begin at a higher level of aggregation than the household—namely, with institutional arrangements like those just listed, as well as other factors such as agroclimatic conditions, cropping systems, level of technological advance in agricultural production, and so on.

I will not discuss the "pure income" effect interpretation of the positive land-fertility relationship except to note that, conceptually, it also runs afoul of the inherent instability of operational holdings. Taking current farm size as a measure of "permanent income" is at least as precarious as the strong assumption of stability of holdings over time that is required by both the land-security and land-labor demand hypotheses.

Landholding and Fertility as a Spurious Relationship

If the land-labor demand and pure income effect hypotheses are not valid, then what does explain the positive relationship between landholding and fertility among rural households? Although I am not at all sure that a general explanation exists, it is possible that the solution is much more mundane and mechanistic than is suggested by the hypotheses just entertained. As mentioned in the introduction, the working assumption of most researchers is that the relationship between land and fertility is the product of deliberate fertility control, motivated by demand considerations. An alternative working assumption is that such fertility differentials are the unintended by-product of other behavioral patterns that are associated with landholding status. If so, one might still be some distance from an "explanation," since motives cannot be divined. However, by identifying the mechanism that produces the differential—the proximate determinant—one can narrow the gap considerably.

Bangladesh is an interesting example because landholding is one of the few socio-economic variables that show a consistent and significant relationship to marital fertility.[16] There, too, the relationship is positive. Bangladesh is also of interest because contraceptive prevalence in rural areas is very low, and cannot account for the fertility differentials that exist. Unusually precise estimates of the current total marital fertility rates of different landholding groups are available for Bangladesh from Matlab Thana of Comilla District. Calculated from the records of a unique vital registration system, covering a population of almost 20,000 currently married women of ages 15-49, from 1968 to 1970, these estimates are reproduced below:[17]

Landholding in acres				
Landless	<1	1—1.9	2—2.9	3+
6.8	7.1	7.3	7.4	7.7

If systematic differences in the prevalence of contraceptive practice do not account for these differentials, what can explain them? Drawing on Bongaarts,[18] the remaining intermediate fertility variables through one or more of which these differentials must be generated are prevalence of induced abortion, postpartum infecundability, spontaneous intrauterine mortality, permanent sterility, and fecundability. There is no reason or evidence to suggest that differentials in the incidence of induced abortion are responsible; nor is there evidence of systematic differences in length of breastfeeding. Prolonged postpartum abstinence is not practiced in any segment of Bangladesh society.[19]

The weight of evidence suggests that nutritional and health differences associated with the above landholding status groups have only a small effect on spontaneous intrauterine mortality and the incidence of permanent sterility, and very little effect on timing of the resumption of ovulation postpartum.[20] A more plausible effect of nutrition and health differentials is on frequency of intercourse. There is some evidence to support this for Bangladesh, although the responses of men and women from the study in question are so inconsistent that it is difficult to give them credence.[21] The effects of differential intrauterine mortality, primary sterility, and frequency of intercourse no doubt combine to produce some (probably small) positive association between landholding and fertility; however, counterbalancing these positive effects is the negative fertility impact of differential infant mortality,[22] which, because of its higher incidence among the poor, tends to shorten their birth intervals.

Another factor with potentially large effects on fecundability and fertility is spouse separation. The fertility effects of spouse separation, due, for example, to the temporary labor migration of the husband, have been investigated with the use of simulation models,[23] but rarely in actual populations. There is considerable short-term, rural-to-rural labor migration among the landless and near landless in Bangladesh,[24] and thus, given the relative immobility of cultivators, spouse separation is a plausible proximate determinant of the fertility differential shown above.

Reliable data on separation of spouses are difficult to collect, and this may be why the subject has received so little attention. Time use data from the village that I studied permit the estimation of periods of spouse separation for different landholding groups. Although covering only a single village (and in Mymensingh District rather than Comilla), these estimates do, I believe, provide a rough order of magnitude of interclass differences. The data refer to a sample of 336 currently married males and females, from whom records of time use were taken for one day every two weeks (approximately) throughout the calendar year 1977. This sample yielded a total of 6490 days of observation.[25]

For that part of the sample owning no arable land, spouses were separated on average for 97 days (overnight absences) out of the year (of which 61 days were due to work-related absences of the male and 36 days were due to the absence of the female—normally on unaccompanied visits to her family of birth). Among those owning one acre of arable land or more, spouses were separated on average for 31 days during the year (of which 10 days were due to male, work-related absences, and 21 days to the absence of the female). Therefore, the difference between the relatively rich (one acre or more) and poor (landless) in the separation of spouses is 66 days—a bit more than two months. (In the residual group—those owning less than one acre of land—spouses were separated for an average of 51 days.)

Bongaarts and Potter have simulated the effects of different periods of separation on fertility[26]. Their model assumes population parameters such as mean age at marriage and expectation of life at birth—that closely approximate conditions in rural Bangladesh. With additional assumptions concerning fecundability, risk of fetal death, and mean non-susceptible interval associated with a live birth (27 months) that are appropriate for Bangladesh, the simulation model suggests that the additional period of separation experienced by the landless (66 days) reduces their fertility by 8 per cent relative to the more wealthy. Regrouping of the data presented by Stoeckel and Chowdhury, to correspond more closely with our categories of land ownership, yields total marital fertility rates (TMFR) of 7.4 for women in families with one or more acre, and 6.8 for women in families who own no land. The TMFR of the relatively poor in this case is 8 per cent less than that of the more wealthy—a difference that could be accounted for entirely by class differences in periods of spouse separation.

Having identified a plausible proximate determinant of the fertility differential (bravely accepting spouse separation as such), what can be inferred about the extent to which the proximate behavior is either motivated by, or accommodating to, underlying fertility goals? Regarding the former, it is difficult to imagine that labor migration and other causes of spouse separation are undertaken with fertility control in mind. These are exceedingly inefficient methods of birth control, and, given the ready availability of alternative effective methods, are unlikely to be engaged in for that purpose. This conclusion is more hazardous when the proximate variable of importance is either breastfeeding or postpartum abstinence.[27] Regarding accommodation, it is more difficult to say. Accommodation is a weaker proposition, requiring only that the intergroup fertility differentials be noted by the members and accepted. I would question, however, whether these differentials are perceptible to individuals in the population: not very much separates the group means and, given the large element of chance in reproduction, within group variance would swamp between group variance.

Conclusion

I do not mean to suggest that patterns of labor migration and spouse separation are a general explanation for the positive relationship between landholding and fertility that has been so widely noted in the empirical literature (although they probably are important factors in some other settings). On the other hand, close attention to the "proximate" mechanisms producing the relationship is certainly advisable in all cases. As noted recently by McNicoll, "first, the pure biology of the situation must be disposed of to ensure that one is not caught explaining in economic or social terms more than in fact remains to be explained in these terms:"[28] For Bangladesh it is sobering to contrast the policy implications of the labor migration interpretation of the positive land-fertility relationship (minimal) with the far-reaching, but quite incorrect, lessons for land reform and other major policy issues flowing from the land-labor demand interpretation.

Our discussion of the relationship between landholding and fertility, and the pertinence of the land-security and land-labor demand hypotheses, illustrates the potentially high cost of abstracting from the institutional context of individual and household behavior. Consideration of property institutions, tenancy, and a range of complementary markets raises serious questions about the logic of the model specification in Table 1 and the appropriateness of framing the hypotheses in such institutionally unconditional terms. It is important to emphasize that the problem is not specific to the particular choice of variables that appear in that table, a choice that many would dispute. The problem should be seen instead to lie with level of analysis (the household) and the strong implicit behavioral and institutional assumptions that this mode of analysis entails. Unfortunately, critical assumptions are all too often convenient concessions to data limitations and (or) problems of analytical tractability, rather than empirically-based foundations of a theoretical argument. In my view, it is most unlikely that major advances in understanding the determinants of fertility will result from further empirical replication of relationships at the household level or further refinement of narrowly focused theories of household behavior. What is called for is an effort to broaden the scope of inquiry, to sketch in the institutional reality of particular settings, and to incorporate this reality in analyses of individual reproductive behavior.

---

1. E. Mueller and K. Short, "Income and wealth as they affect the demand for children in developing countries," in *Determinants of Fertility in Developing Countries*, eds. R.A. Bulatao et al. (New York: Academic Press, 1983), pp. 474–517.

2. R.D. Lee and R.A. Bulatao, "The demand for children: a critical essay," in Bulatao et al., *op. cit.* in footnote 1, pp. 191–233.

3. This project has produced a large number of papers on agricultural policy, land, and fertility: Y. Chalamwong, M.R. Nelson and W.A. Schutjer, "Variation in land availability and human fertility among Thai rice farmers," paper presented at the Population Association of America meetings, Philadelphia, Pennsylvania, 1979; G. Laidig, W.A. Schutjer, C.S. Stokes, "Agricultural variation and human fertility in antebellum Pennsylvania: A research note," *Journal of Family History*, 6, 1981, pp. 195—203; W.A. Schutjer, "Agricultural development policy and the demographic transition," *Journal of Developing Areas*, 12, pp. 269-280; W.A. Schutjer, C.S. Stokes and G. Cornwall, "Relationships among land, tenancy, and fertility: A study of Philippine barrios," *Journal of* Developing Areas, 15, 1980 pp 83–96; W.A. Schutjer and C.S. Stokes, "The human fertility implications of food and agricultural policies in less-developed countries, Bulletin 835, Agricultural Experiment Station, Pennsylvania State University, 1982; W.A. Schutjer and C.S. Stokes, "Agricultural policies and human fertility: Some emerging connections," *Population Research and Policy Review*, 1 (3), 1982, pp. 225—244; and C.S. Stokes and W.A. Schutjer, "A cautionary note on public policies in conflict: land reform and human fertility in rural Egypt," *Comparative Politics*, forthcoming, 1983.

4. This interpretation assumes that in rural areas land is a good proxy for permanent income, that "children provide many important social and psychic satisfactions to parents, that these satisfactions cannot be efficiently obtained by other expenditures, and that they do not have a low income elasticity of demand," Mueller and Short, loc. cit. in footnote 1, p. 507.

5. Stokes and Schutjer, *loc. cit.* in footnote 3, p. 3.

6. *Ibid.*

7. N.S. Jodha, "Agricultural tenancy in semi-arid tropical villages of India," Economics Program Progress Report No. 17 (Patancheru, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, 1980).

8. M. Cain, "Risk and insurance: perspectives on fertility and agrarian change in India and Bangladesh," *Population and Development Review*, 7 (3), 1981, pp. 435—474.

9. Suhutjer and Stokes, , "The human fertility implications.....," *loc. cit.* in footnote 3, p. 11.

10. For an argument that land is the *preferred* source of security for rural Indians see: M. Vlassoff and C. Vlassoff, "Old age security and the utility of children in rural India," *Population Studies*, 34 (3), 1980, pp. 487—499.

11. On this, see: Y. Ben-Porath, "The F-connection: Families, friends, and firms and the organization of exchange," *Population and Development Review*, 6 (1), 1980, pp. 1—30.

12. Cain, *loc, cit.* in footnote. 8.

13. It should be noted, consistent with the positive relationship between size of family labor force and land leased in, that households with substantial labor probably capitalize on these advantages by engaging in sharecropping. Indeed, sharecropping in Bangladesh is such a marginal enterprise (tenant and landlord split the yield 50=50) that it is arguably necessary to meet labor demands with family labor. Why is this so? Sharecroppers are more likely to be cash poor; credit is expensive; and gross margins are low on average, and highly variable firm season to season. In fact, average gross margins barely exceed what could, for the same amount of labor, be earned the labor market. Why, it might be asked, does anyone sharecrop at all? The tenant is protected from the vagaries of food price inflation, there is some return (on average) in excess of alternative wage earnings, and there is a status cost to selling one's labor. The fact that only 7 out of 343 village households are pure tenants and only 20 percent of village lands are under tenancy, however, reflects the precariousness of sharecropping as a means of livelihood. The great majority of tenants are supplementing ownership holdings that are too small to meet subsistence needs.

14. The data are from: M Cain, "The economic activities of children in a village in Bangladesh," *Population and Development Review*, 3 (3), 1977, pp. 218.

15. Schutjer and Stokes, "The human fertility implications.....," *loc. cit.* in footnote 3, p. 11.

16. M. Alauddin, *Socioeconomic Determinants of Fertility in Bangladesh: A Review* (Dhaka: Institute of Social Welfare and Research, 1980).

17. J. Stoeckel and A.K.M.A Chowdhury, "Fertility and socio-economic status in rural Bangladesh : Differentials and linkages," *Population Studies*, 34 (3), Table 2, p. 521.

18. J. Bongaarts, "The fertility-inhibiting effects of the intermediate fertility variaoles," Center for Policy Studies Working Paper No. 57, The Population Council, New York, 1980.

19. C. Maloney, K. Aziz, and P.C. Sarker, *Beliefs and Fertility in Bangladesh* (Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1980).

20. J. Bongaarts, "Does malnutrition affect fecundity? A summary of evidence," *Science*, 208, 1980, pp. 564—569; and R. Gray, "The impact of health and nutrition on natural fertility," in Bulatao et al., *op. cit.* in footnote 1, pp. 115—133.

21. Maloney et al., *op. cit.* in footnote 19.

22. S. D'Souza and A. Bhuiya, "Socio-economic mortality differentials in a rural area of Bangladesh," *Population and Development Review*, 8 (4), 1982.

23. See: J. Menken, "Seasonal migration and seasonal variation in fecundability: Effects on birth rates and birth intervals," *Demography* 16 (1), 1979, pp. 103—119; and J. Bongaarts and R.G. Potter, "Fertility effect of seasonal migration and seasonal variation in fecundability: Test of a useful approximation under more general conditions," *Demography* 16 (3), pp. 475—479.

24. M. Cain and A.B.M.K.A. Mozumder, "Labor market structure and reproductive behavior in rural South Asia," in *Child Work, Poverty and Underdevelopment*, eds. G. Rodgers and G. Standing (Geneva: International Labour Office, 1981).

25. Methods of data collection are described in Cain and Mozumder, *loc. cit.* in footnote 24.

26. Bongaarts and Potter, *loc. cit.* in footnote 23.

27. For example, see the discussion of the case of Indonesia in G. Mc Nicoll and M. Singarimbun, "Fertility decline in Indonesia I. Background and proximate determinants," Center for Policy Studies Working Paper No. 92, The Population Council, New York, 1982.

28. G. McNicoll, "Institutional determinants of fertility change," *Population and Development Review*, 6 (3), 1980.

POPULATION AND RURAL INFRASTRUCTURE (WITH SPECIAL EMPHASIS ON IMPLICATIONS OF POPULATIONS GROWTH FOR DEVELOPMENT PROCESS)

P. B. DESAI

Times inevitably and unretrievably change, leaving at times ghosts to haunt the future. Post-Second World War baby boom has long passed into history and several of the countries that matter in the world's economic order are experiencing levels of fertility that pose for them a threat of absolute decrease in population in not distant a future, as if the ghost of the late 1930's has returned. There the autonomous expansion of infrastructures have led to universalization of consumption patterns, life styles and demographic profiles characterised by low mortality and fertility levels. While age structures are skewed in favour of the aged, it is proving difficult to induce marriages to result in the desired levels of procreation. Consumerism has to a large extent replaced reproduction.

2. The developing world continues, in contrast, to hibernate on the periphery of the international economy, with greatly compounded social, economic and demographic problems. Many countries of this so-called 'Third World' have experienced, in more recent decades, a rather rapid transition in fertility. Among them, the countries of middle south Asia appear to be lagging behind. Some evidence of an enduring decrease in fertility levels has appeared in small pockets within each of these countries but the national natural increase rates are as yet resisting to recede from the high peaks reached in 1960's or 1970's. These rates would have been higher still had the mortality transition completed its full course in these countries too. The failure of the mortality transition to do so is crucial. Among other things, it is not unlikely that it has strongly tended to compromise the success of official effort to decrease fertility through family planning. Thus, while the end of the so-called 'population explosion' is, for many world watchers, in sight, the situation in the developing countries has remained as uneasy as it had ever grown to be.

3. The sole cause of this uneasy state of affairs is not the mere limitation of the success of family planning programmes to the prevention of further acceleration in the rates of population increase. Equally responsible are factors that have prevented the development process to accelerate and to avoid perpetration of economic imbalances, social inequities and regional disparities in its course. Population intervention and development planning processes remain uncoordinated, while the Bucharest plea for population-development integration has degenerated into a mere slogan. Perhaps semantics of the Bucharest proposition prevented clarity of thinking that could inform formulation of national policies. The plea for population and development integration implied that population and development were the two interrelated but analytically distinct categories of phenomena which called for a conscious effort for their synchronization. Such an effort of synchronization of population and development does not indeed seem to underlie the fertility transitions that have been achieved by several countries of South-East Asia. Indeed, a careful analysis suggests that the lead enjoyed by these countries in securing economic development *per se* seems to have helped these countries to make a success of their family planning movements and to thereby reduce their fertility levels.

4. It is also possible that the slogan 'development is the best contraceptive' which was pronounced by some at Bucharest had added only confusion to the consideration of population vis-a-vis development. The notion is valid from a long-term point of view, but it appears to have been construed as an argument in favour of imparting a developmental orientation to population intervention. In the result, its long-term thrust was sidetracked to advocate integration of population and development. In the literature that has since been devoted to this problem of integrating population and development, there has been an unending endorsement of its desirability and even urgency, but not enough light is thrown on how in actual practice it can be achieved. It has, in consequence, remained an empty conceptualisation. Development planners have merrily gone on planning in their old ways and population enthusiasts have persisted in their advocacy of the government taking up full responsibility for restraining population growth. Planners view this advocacy favourably but without caring to critically examine their own strategy to find out whether it can be modified in order to justify their acceptance of that advocacy.

5. In the light of the course that the debate has taken, we are inclined to consider both the slogans 'Integration of population and development' and 'Development is the best contraceptive', as quite unhelpful to the cause of attaining social progress or of improving the quality of life. We would argue that what is called for a strategy of social action that subsumes population within development. In other words, development should treat population both as its object, and subject, or as embodying in itself both its ends and means. It is in the light of this position that we might consider the issues involved in the creation of rural infrastructure. We must obviously deal with the rural infrastructure as an element

49—5 RGI/ND/84

of the development process which facilitates the harnessing of the energies of the people for their own economic advancement. Economic advancement necessarily implies a social order as a goal to be reached. We may add that the social order as a goal needs to be defined comprehensively to cover its varied economic, social and demographic aspects.

6. There has been considerable emphasis in recent years on 'rural' development. This need to qualify development as rural carries an implication that we are turning attention now to something that had been neglected before. It also carries the implication that something which is categorised as rural now will remain to be so categorised in the future. It is, in a sense, ironic that we have to categorise development into rural and urban, the rural-urban dichotomy being quite arbitrary in nature in so far, at least, as most developing countries are concerned. The term, therefore, is admissible only to the extent that development as a strategy may choose to proceed in stages in which it accepts precedence of the sectors of the economy whose activities are better conducted in larger concentrations of population. The latter activities too require development of infrastructures, that is, of services and facilities needed for their efficient pursuit. But they inevitably form parts of national infrastructures and cannot sustain their own development without the other parts of national infrastructures being commensurately developed in due course.

7. In actual practice the early emphasis on rapid industrialisation which was supposed to lead to higher rates of growth in GNP had, in India for example, resulted in large investments going into urban-based or urbanisation—fostering infrastructures. These have no doubt contributed to the creation of a viable national economic base comprising public utilities or transport, communications, power, irrigation etc.; heavy and key industries like iron and steel, fertilizers, oil refineries, heavy machinery etc., and a considerable pool of scientific skills, technological expertise and design capacity. But it must be said, at the same time, that this has involved a lesser attention being paid to the agrarian base and so to the rural population. Another consequence of this kind of GNP-oriented industrialisation strategy was a considerable neglect of social services that were necessary for the improvement of manpower potentials. The latter, in turn, meant the failure of the development process to generate, on any meaningful scale, social change of the kind that helps to generate motivations for changing life styles and behaviour patterns on the part of the common people. From the point of view of population, the development process may be said to have contributed to the acceleration of the rate of its growth and accentuation of quite unhelpful trends in its redistribution, particularly between the so-called rural and urban areas.

8. With the passage of time, it became evident that economic, social and demographic differentiation between the expanding non-agricultural and the agricultural sector or between the urban and the rural populations tended greatly to accentuate. It is from this development that the case for emphasis on rural development and so on rural infrastructure has strongly emerged. We must admit the need now of paying greater attention to the development of this rural infrastructure and to ensure in the process that it is simultaneously tailored to the needs of influencing population trends in the desired direction. The creation of the rural infrastructure must serve the purposes of generating a population-oriented development process in the so called rural areas. It must be based, in other words, on the economic and social needs of the rural people, whose satisfaction would necessarily influence their demographic behaviour.

9. Planning for the construction of the infrastructure in the rural areas must be directed towards generating a rural development process that should now be comparatively much faster so that the rural part of the economy catches up with the urban part and the two get integrated to form a viable whole. Rural areas today are characterised by considerable underemployment, low labour productivity, inefficient use of scarce resources, particularly land, comparatively high vital rates and a great deal of social disorganisation. Rural development must, therefore, simultaneously aim at increased employment levels, increased labour productivity, social cohesion, and modification of demographic trends. If we confine attention to the more manageable aspects of the whole complex of issues involved, rural development should help to improve productivity or rural incomes; to improve health conditions and to restrain reproduction at the same time; and to prevent out-migration. It is for such a development that we need to construct the necessary infrastructure.

10. In substantive terms, the needed infrastructural services and facilities can be divided into two categories—economic and social. Both need to be taken up simultaneously and the construction of the infrastructure should proceed in a balanced manner. The division between economic and social components of the infrastructure cannot be watertight. In fact, several of the items in the infrastructure may serve both economic and social purposes simultaneously. A further consideration that enters into the provision of infrastructure is that it should take into consideration the existing social inequalities and economic disparities characterising rural areas. Accordingly, while it is in order to have a minimal unified infrastructure serving the rural population as a whole, it will need to be supplemented by additional facilities and services meant for the benefit of certain identified sections of the rural population. What we are pleading for is a unified approach to the development of rural infrastructure that comprehensively covers its varied components. We do not view with favour the present practice of operating a string of uncoordinated ad-hoc schemes that attempt to meet individual needs of either the rural population as a whole or some of its identified segments.

11. The economic components of the infrastructure are those that serve to support the effort to raise productivity of agriculture and to promote diversifica-

tion of rural occupational base. Secondly, they may include facilities and services required for raising educational levels and technical skills of the rural working force and thereby serving to raise its employment potential. The economic infrastructure needs to be oriented to the promotion of agricultural, allied and even non-agricultural rural economic activities, to the expansion of the scope for marketing of rural produce and to the task of processing the rural manpower into an educated and efficient labour force.

12. Obviously, none of these items are excluded from the purview of the national or state plans. The sectors in the plans that include these items of infrastructure development are irrigation, power, transport and communications, trade and banking, and also education including the promotion of technical education. In each case, however, the outreach of the development activities has not yet covered rural areas to a sufficient extent. Further, wherever they have reached, the benefits have tended to be appropriated by the better-off sections within the rural population. In the transport sector, for example, while the development has been rapid upto the district roads, the village link roads are either absent or in bad repairs. Likewise, in the case of credit, the cooperatives generally serve the better-off asset holders among the cultivating classes, while the rapid spread of bank branches in the commercial sector has helped more to plough out rather than plough in savings in so far as the rural areas are concerned. The failure of infrastructure development including that of power and irrigation is not that they have not spread to rural areas, but mainly that the distribution of their benefits fails to meet equity criteria. For wholesome rural development further expansion of the economic infrastructure will remain contingent on the extent to which these past deficiences are eliminated. More importantly, specific attempts are needed to make it employment-oriented.

13. If rural economic development proceeds on the basis of such an expansion and reorientation of the economic infrastructure, it will not fail to have a healthy influence on rural social conditions. This influence would need, however, to be greatly strengthened by the social component of the infrastructure that is created. Some of the economic items like transport, communications and even electrification have a social dimension, but here we are specifically concerned with such services as education, health, family welfare and social security. All these items do have a place in national and state plans, but even while their delivery systems have spread throughout the countryside, their performance has remained very unsatisfactory.

14. In India, for example, we have 5,532 primary health centres, 49,229 sub-centres in the vast rural expanse of the country. This national network also seeks to provide family planning services. Its wide proliferation has not, however, helped the country to bring the mortality transition to a conclusion, nor has it helped to reduce fertility through family planning by such an extent as to compensate for whatever reduction that has been achieved in mortality. Even more damaging is the generally shared judgement about the performance of the education system. While the physical infrastructure for primary education has spread throughout the countryside, it has not been able to wipe out rural illiteracy whose incidence among women continues to be unduly high. Educational wastage in terms of the incidence of drop-outs is disproportionately high. These two basic services, that help to build up human material in rural areas and that could at the same time generate wholesome social change of the kind that may lead to changes in life styles and fertility behaviour, need urgently to be overhauled and greatly strengthened.

15. The argument that economic growth and social development are vital for generating population change can easily be admitted. The main issue that arises relates to the agency for the creation of infrastructure that would help to generate these economic, social and demographic trends in a coordinated manner. Central planning, which has had a tenure of nearly three decades in several countries has not accomplished this job of establishing viable rural infrastructures to any great extent. With the establishment of viable national economic bases, it is time now that planning should proceed to the strengthening of the economic bases in different regions and within regions of the economies of individual communities by promoting the emergence of well-reticulated infrastructures that adequately serve the needs of a coordinated process of social and demographic development. In the process, central planning must limit its role to supporting and monitoring the establishment of rural infrastructures. The main task of planning, creation and maintenance of infrastructures must devolve on the local levels.

16. This argument is well-supported by the Alma Ata Declaration on primary health care. This Declaration advocates that for the attainment of 'Health for All by 2000', there is no alternative to the creation of a primary health care delivery system based

squarely on community participation, self-reliance and the spirit of social justice. The Declaration pleads that the planning, development and running of the primary health care delivery system should be the responsibility of the community itself and further that the whole superstructure of the health care delivery should subserve the purposes of the primary health care delivery system. Primary health includes family planning and together they represent one of the most crucial elements of the rural infrastructure. If we succeed in involving the people in the creation of such a primary health care delivery system, there is no reason to think that this cannot be repeated for similar other elements of the rural infrastructure including education and employment generation. Success in the establishment of a viable rural infrastructure and, therefore, in generating comprehensive development in rural areas would depend on the imagination with which planners at the central level provide the scope for the participation of the people in the development process at the grassroots level. If they do so, the responsibility for the resolution of the so-called population problem will rest on the people themselves. The audacity of taking the people for granted must be liquidated, that is the one condition that will ensure the emergence of rural infrastructures in a manner and of the kind that are meaningful for successful processes of demographic transition.

POPULATION GROWTH AND AGRICULTURAL DEVELOPMENT IN NORTH INDIA*

ROBERT E. EVENSON

The relationship between rapid population growth and agricultural development has been a continuing source of policy concern at least since Thomas Malthus offered his dismal arithmetic more than a century ago. The popular literature dealing with the "race between population growth and food production" has been subject to wide swings in opinion. It has alternated between the starkness of Malthusian arithmetic and the enthusiasm associated with successful rural development and related programs. In India the post-independence optimism based on community development programs in the 1950s gave way to Malthusian pessimism in the early 1960s as population growth rates rose and food production fell far short of planning targets. This pessimism gave way in the late 1960s to a high level of optimism based on the rapid adoption of "green revolution" wheat and rice varieties. Pessimism was the order of the day again in the early 1970s as the green revolution failed to live up to expectations and world economies were shocked by large increases in energy prices. The late 1970s produced a rather mixed prognosis with some writers continuing to press doomsday arguments, often based on the newly discovered "fragility of eco-systems", while others noted that Indian agricultural production in the 1970s had increased at a moderately high rate and that the pessimistic forecasts of the early 1970s had not materialized.

Few, if any, quantitative studies of the impact of population pressure on agricultural development (broadly defined) have been made. The literature dealing with farm management problems and production costs and returns is quite extensive and rich. Similarly, the literature dealing with factors influencing population growth is large and substantive. However, few writers have attempted an integrated treatment of the impact of population pressure or density on the rural economy. That effect is realized basically in three ways. The most direct and immediate effect of an increase in population is on demand. More mouths to feed mean an increase in demand for food and other products. This affects food prices. A second effect is realized through labor supply. As children mature they provide more labor to the family farming enterprise or to labor markets outside the family enterprise. This affects wage rates (even if they are paid in kind) and family incomes. A third effect is more subtle. It is the effect of population pressure on the "structure" of agricultural production.

By structure I mean such factors as size of farm, tenancy, fragmentation of farms, rural services, rural electrification, irrigation investments, land clearing and drainage, and schooling, research and extension investments. These factors reflect both private and public decisions. These decisions are responsive to a number of factors including prices and wages. Population pressure, however, can influence them in important ways and thus affect welfare indirectly. Esther Boserup, in her *Conditions of Agricultural Growth*, persuasively argued the case for these structural effects for long spans of history.

She pointed out that as population density increases in a given land resource base, new techniques of cultivation are developed to allow more intensive forms of cultivation. Farming systems evolve through swidden, long fallow, annual cropping and multiple cropping forms as population density increases. Investment in land clearing and drainage and in irrigation capital accompanies these changes.

Rice cultivation in Japan in the mid-19th century and in Java in the mid-20th century could be cited as extreme examples of population-induced intensive production systems where little or no public or private investments beyond those directly induced by population change were made. In each case, more than 300 mandays of labor per hectare were employed in rice production. With the Meiji restoration in Japan and more recently in Java, investments not directly induced by population growth were made. These investments, particularly investments in the development of improved varietal and other technology, have had high pay-offs and have altered the "Boserupian" equilibriums.

While not necessarily committed to Boserup's general conclusions, I am, in this paper, attempting to investigate this relationship using contemporary Indian data. In Part I, I set out a semi-formal analysis first of farm decision-making given the structure and the price regimes facing farmers, and second of the determinants of structure. I then show how these two analyses can be incorporated into a small general equilibrium economic model whereby one can compute the effect of population growth on a number of important variables. In Part II, I report an empirical analysis of farmer behavior in North Indian agriculture using district level data. In Part III, I report an analysis of determinants of structural variables using data from the same districts. Part IV

*Prepared for the Conference of Recent Population Trends in South-West Asia—February 2–8, New Delhi. Sponsored by the East-West Center and the Registrar General's Office, Government of India. This paper was written while the author was a Visiting Fellow at the East-West Population Institute. Financial support for this research was provided by the East-West Center and the General Services Foundation.

reports a policy analysis where I simulate the effects of population growth, investment in research and other factors subject to policy action. The concluding section discusses the implications for agricultural development and real incomes of programs designed to reduce population growth in India.

I should make it clear that while my central concern in this paper is with the effects of population pressure on agricultural development, I do not in any way deny that agricultural development has an effect on population growth. However, since I will be dealing with a relatively short post-independence period, 1959-1974, changes in agricultural development such as the high yielding varietal technology introduced in the 1960s would have affected birth rates in the 1960s but would have had little effect on the numbers of agricultural workers and cultivators until some 15 years later. Thus I am setting aside the causal relationship between agricultural development and population growth itself on the grounds that a long time lag is involved.

I. Conceptual Foundations

In this section, my purpose is to sketch out the theoretical foundations for the sections to follow. Figure 1 provides a schematic view of the approach. The "core" of the approach is the specification of producer behavior. From this behavior we can derive *supply* curves for agricultural products and *demand* curves for variable agricultural inputs. These are derived for a given *structure* of production.

In the North India study, I will be specifying a producer core in which producers supply four crops or crop combinations: rice, wheat, coarse cereals (maize, sorghums and millets) and other crops (sugarcane, pulses, etc.). Producers employ four variable factors of production: fertilizer, animal power, tractors and labor. The structure of these farms is measured by the degree of rural electrification, investment in roads, rainfall and climate, irrigation investment, size of farm, and the availability of new technology as measured by the proportion of area planted to high yielding varieties and by past investment in research and extension.

The theoretical basis for deriving the core relationships rests on the "duality" between maximized profits and the technical transformation function relating the four variable outputs to the four variable factors and the structure variables. When certain restrictions hold for the maximized profits function, duality theory insures that they also hold for the transformation function. The important thing about this fact is that we can specify a functional form for the maximized profits function directly. This is much simpler than specifying a functional form for the transformation function and "solving" for the maximized profits function. The maximized profits funciton does not include choice or endogenous variables such as the variable products or variable factors of production. They are eliminated from the expression by substitution of "first order conditions." Thus maximized profits are expressed as a function of prices and structure variables. We can then apply the Hotelling-Shephard lemma to the maximized profits function. This lemma states that the first partial derivatives of the maximized profits function with respect to an output or factor price are the output supply and factor demand functions.[2] Thus by taking eight partial derivatives, we end up with a system of 4 output supply functions and 4 factor demand equations. Each equation relates the quantity supplied (or demanded) to the eight variable prices and the structure variables.[3]

The producer core estimates reported in Part II of this paper utilize the "Normalized Quadratic" functional form, one of several "flexible functional forms" available. This core system of 8 equations measures the responsiveness of farmers to prices and to structural variables. In Part III of the paper I develop a secondary "long run" analysis designed to measure the responsiveness of some parts of agricultural structure to prices and to population pressure. This essentially involves treating the structural variables as subject to choice by interest groups, including farmers, working through state and local government institutions.

Population growth has three impacts on the economic model depicted in Figure 1. First, it affects the supply of labor in the agricultural labor market. An increase in labor supply, other things, equal, will result in a decrease in wages. This wage change in turn will have an impact on farm production (given farm structure). A decrease in wages will generally lead to an increase in output supply of most commodities and this in turn will lead to a decrease in output prices. Finally, an increase in population will increase the demand for agricultural and other products.

These three impacts of population growth will be incorporated in a policy simulation exercise reported in Part IV of the paper. A model is set up to compute an initial equilibrium set of factor employments and factor prices, and product supplies and product prices.[4] The model is then "shocked" by a simulated increase in population pressure. A short term effect is calculated holding farm structure constant but allowing for the population effects on labor market supply and on output demand. A longer run effect is also calculated allowing population pressure to change farm structure.

II. The Producer Core

Agricultural output supply and factor demand for given agricultural structure in North India.

In this section I report estimates of eight equations describing farm production in North Indian agriculture. The eight equations, four variable output supply equations and four variable input demand equations, are derived from a maximized profits equation as discussed above. A formal derivation of these

equations and the actual estimated equations are reported and discussed in Evenson (1983). For our purposes here we will concentrate on the estimated "elasticities" instead of the actual co-efficients.

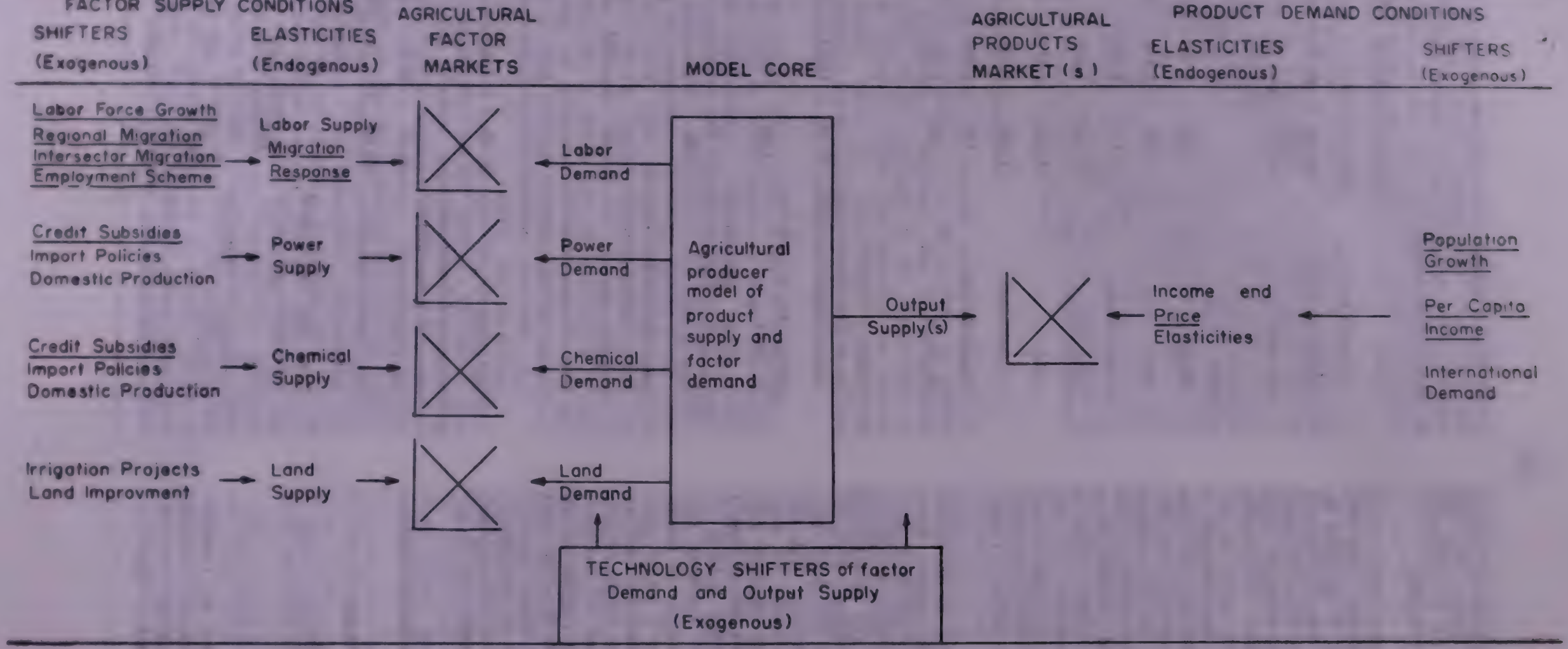
The estimates were obtained using district level data from the states of Punjab, Haryana, Uttar Pradesh and Bihar. These districts can be grouped into two major groups, a primarily wheat producing area (Punjab, Haryana and Western Uttar Pradesh) and a primarily rice producing area (Eastern Uttar Pradesh and Bihar). Table 1 provides a variables dictionary for the data set and reports means for the two areas.[5] A brief description of the definition of each variable is provided. The variables are also classified as variable farm outputs, variable farm inputs, prices, and structure variables. In this analysis it is presumed that farmers maximize variable profits by choosing the appropriate mix of variable farm outputs and variable farm inputs. These variables are thus choice or "endogenous" variables. I am assuming in this model that the typical farm has no control over farm prices. (In Part III of the paper I am treating the structure variables as subject to long-run choice).

Table 2 reports elasticities computed at the means of the data for the eight equations. By reading down each column one obtains the elasticity effects of each price and structure variable on the output supply or input demand variable in question. For example, in the first column we can see the estimated effects on wheat supply of the wheat price, the rice price, etc., all the way down to the research variable. (All statistically significant variables are indicated by asterisks). We note that the wheat supply elasticity with respect to its own price is .370. This means that a 10 per cent increase in the wheat price, holding all other prices and structural variables constant, will cause a 3.7 per cent increase in the supply of wheat. We can also see the consequences of a wheat price increase, holding everything else constant, not only on wheat supply but on the supply of rice, coarse cereals, and other crops, and on the demand for fertilizer, bullock labor, tractors, and labor by reading across the wheat price row in the table. We thus find that a 10 per cent increase in the price of wheat causes a 3.7 per cent increase in the quantity of wheat supplied, a 2.07 per cent decrease in the quantity of rice supplied, a 2.24 per cent increase in the quantity of coarse cereals supplied, etc.

Table 1 : Variables Dictionary: North Indian Data Set Observations on 22 Regions, 1959—74

Variable Definitions	Means		
	Wheat Region	Rice Region	All
1	2	3	4
1. Variable Farm Outputs			
Wheat	20678.19	10124.76	16360.88
Rice	4319.35	22083.35	11586.44
Cereal Grains	5660.20	4467.06	5172.10
Other Crops	25833.99	16114.35	21857.78
2. Variable Farm Inputs			
Labor	22006.25	41818.24	30111.16
Animal Power	21841.10	50139.95	33417.90
Tractor Services	1038.04	255.74	718.42
Fertilizer	4155.17	2641.76	3536.05
3. Prices			
Wheat	2.215	2.291	2.246
Rice	2.058	1.879	1.984
Cereal Grains	2.174	2.390	2.262
Other Crops	2.898	3.288	3.058
Labor	2.041	2.111	2.070
Animal Power	1.790	1.371	1.619
Tractor Services	1.577	1.577	1.577
Fertilizer	1.278	1.307	1.290
4. Structure Variables			
Rural Electrification (per cent of villages electrified)	38.99	15.25	29.28
Roads (km of roads per 10 km²)	2.08	1.11	1.68
Research Expenditures (cumulative expenditures, 1955 to t-2)	9.56	4.61	7.54
Research Intensity (current expenditures/net cropped area)	1.49	.865	1.23
High Yielding Varieties (per cent of gross cropped area under high yielding varieties of rice, wheat and maize)	10.79	7.09	9.27
Irrigation Intensity (per cent of gross cropped area irrigated)	40.97	25.31	34.57
Net Cropped Area (000 hectares)	1299.03	1711.52	1467.78
Farm Size (net cropped area/number of cultivators)	.0017	.0012	.0015
Agricultural Laborers/ Cultivators	.265	.430	.332
Literacy (per cent of rural males who are literate)	25.80	27.13	26.34

Figure 1 Distributional Policy Analysis Model: Schematic Representation



Note: The core model and underlined items will receive particular emphasis in estimation and policy simulation

Table 2 : Elasticity Estimates: North Indian District Data Set 1959 -1975

Elasticity with respect to	Elasticities of Output Supply				Elasticities of Input Demand			
	Wheat	Rice	Coarse Cereals	Other Crops	Fertilizer	Bullock Labor	Tractors	Labor
Wheat Price	.370**	—.207**	.224*	—.031	—.007	.016	.010	.001
Rice Price	—.128**	.392**	—.076	—.030	—.198*	.008	—.051	—.060**
Coarse Cereal Prices	.073*	—.040	.040	—.040*	—.155	—.005	.112	.093**
Other Crops Price	—.058	— .090	— .227*	.176**	.348**	.006	— .016	.011
Fertilizer Price	.001	.042*	.062	— .024**	.195*	— .038**	.160	.122**
Bullock Price	— .025	— .019	.025	.005	— .440**	— .010	— .010	.048**
Tractor Price	.001	.003	— .011	.001	.038	— .001	— .084	— .155**
Labor Price	— .232**	— .079	—.038	—.046	.217**	.023**	—.103	—.061**
Electrification	—.025	.011	.057*	.084**	.245**	.006**	.034	—.026**
Roads	—.110	—.465**	.373**	—.362**	— .325**	— .086**	.291*	.029
Rainfall	.161**	.407**	— .173*	.019	.456	.012*	.208*	.055**
Irrigation Int.	1.123**	.271*	.919**	.276**	1.203**	.056**	1.851**	.117**
Net Cropped Area	— .139	1.485**	1.048**	.609**	.289	— .022	—1.266**	.042
Farm Size	.224*	.379**	— .027	— .210**	— .744**	.060**	.693**	— .285**
HYV's	.278**	.109**	— .074**	— .128**	.259**	.012*	—.122**	.030*
Indian Research	.023	—.085**	—.102*	.176**	.249**	—.002	.537**	.084**

*Asymptotic "t" $< 2.0 > > 1.5$
**Asymptotic "t" > 2.0

Our *a priori* expectations of the sign and magnitude of these elasticities are borne out by these data with only one exception. We expect all own price elasticities of supply to be positive and they are. We expect the own price elasticities of demand for inputs to be negative. They are with the exception of fertilizer demand. The cross-price effects are generally as expected. In the output block, when a cross-price elasticity is negative it means that the crops are "substitutes". We note that wheat and rice and other crops and coarse cereals are good substitutes. Interestingly we note that wheat and coarse cereals are "complements", i.e., an increase in the price of one of the pair induces an increase in the supply of both. This can happen when the two crops fit well together in an annual rotation.

Within the input block, negative cross-elasticities indicate that the input pairs are substitutes. Our data show that fertilizer may be a complement to labor and to tractors.

Perhaps of most interest, however, are the "structure" shifters. Our results indicate that rural electrification biases the output mix in favor of coarse cereals and other crops. It biases input demand in favor of fertilizer and against labor. Roads, on the other hand, create biases in favor of coarse cereals and against other crops and are biased against fertilizer and in favor of tractor demand. It should be noted, however, that this variable, and perhaps others, may be reflecting geographical factors and we should not presume therefore that it is easily subject to policy manipulation. The rainfall variable is a strictly geo-climate variable and not subject to policy modification.[6]

Irrigation intensity and net cropped area, on the other hand, are subject to policy manipulation. Increasing irrigation investment increases all outputs and inputs but is quite clearly biased toward wheat and coarse cereals on the output side and fertilizer and tractor use on the input side. As net cropped area in the typical district expands, holding farm size constant, it is biased in favor of rice and coarse cereals and against wheat. It increases the demand for fertilizer, but decreases the demand for tractors. An increase in average farm size, holding total net cropped area constant, on the other hand, is biased against rice and favors other crops, fertilizer and tractor demand. It is biased against labor employment. Conversely, a decrease in farm size would reduce the demand for fertilizer and tractors and increase the demand for labor.

Much has been written about the "Green Revolution" and general technical advances in India. The general presumption of much of the literature is that the introduction of high yielding varieties did not have biases on the input side, though it was clearly biased in favor of wheat and rice on the output side,[7]

Our HYV variable clearly confirms the bias in favor of wheat and rice. It also quite clearly shows that when high yielding wheat and rice varieties are made available, the supply of coarse cereals and other crops is reduced. The results also show a bias in favor of fertilizer on the input side.

The Indian agricultural research system, on the other hand, has a strong bias in favor of other crops. It also appears to have quite strong biases on the input side. It produces technology that is fertilizer and tractor using and labor saving.

The elasticities of total output, total variable input and total variable factor productivity with respect to the policy-related structural variables are reported in Table 3.

Table 3 : Elasticities of Total Output, Total Input and Total Variable Factor Productivity

	Total Output	Total Variable Input	Total Variable Productivity
Electrification . . .	.03357	—.00859	.02450
Irrigation Intensity . .	.58752	.23477	.35275
Net Cropped Area . .	.61071	—.04438	.65509
Farm Size	.06043	—.16189	.22232
HYV's	.04796	.02265	.02531
Indian Research . . .	.04929	—.02037	.06966

Source : Computed from Table 2.

It would appear that rural electrification has a modest effect on productivity. Irrigation intensity has a substantial effect. An expansion of net cropped area, holding irrigation intensity constant, has an effect approximately the same as the irrigation intensity effect. This implies that an expansion of irrigated land has an effect on production approximately twice that of an expansion of unirrigated land.

The farm size variable is showing what appear to be very substantial variable factor scale econmies. Expanding farm size by 10 per cent increases output and decreases inputs holding total net cropped area constant. This is a large scale effect and somewhat at odds with most interpretations of Indian agricultural facts.[8]

This analysis implied very large returns to investment in Indian research. Since I do not have an extension variable in this analysis, it is probably reasonable to suppose that the research variable is picking up both a research and an extension effect. Spending on research and extension combined represented approximately .70 per cent of the value of agricultural product in the early 1960s. A 10 per cent increase of this spending (.70 per cent of output) is estimated to produce a 0.7 per cent increment to net output. This can be converted to a rate of return by noting that an expenditure of .07 per cent of output generates a stream of net output amounting to 0.7 per cent of output after seven years. This implies an internal rate of return to this investment of 72 per cent.[9]

III. Population Pressure and Agricultural Structure

The analysis of structural change is considerably more complex than the short run analysis of farmer behavior in the previous section. Farmers can be presumed to maximize profits and this enables us to develop a consistent econometric framework for analysis Structural variables, on the other hand, fall into two broad classes, neither of which is determined by simple profit maximization. The first class includes variables determined as the outcome of a political process. Public sector investment in research (and extension), roads, electrification and credit programs are in this class. The second class includes variables that are the outcome of long-run market processes based on farmers' investment decisions.[10]

I consider it reasonable to postulate that population density, along with other fundamental characteristics of the economy, influence (through political processes) the investment in the first class of variables. I also consider it reasonable that population density directly influences the long run market process variables. Since public sector stocks of the first class of variables (i.e., cumulated past investment in public sector activities) can affect long run market processes, population pressure also has an indirect effect on the second class of variables.

Table 4 reports elasticities of structure determinants for both classes of variables. The first panel shows determinants of public sector investments. All determinant variables are constructed to be to some extent exogenous to current investment processes. They are all defined as "lagged" variables (i.e., they are measured for the average of the 5 years preceding the year for which investment is measured) which also allows a recursive model interpretation.

Population density (defined as rural population per 1000 ha's of arable land) is the determinant of most interest in this paper. It appears to have a negative impact on research investment, rural electrification and credit provision. Higher consumption gini ratios appear to influence higher spending on research. Urbanization (at the district level) has very small effects. The level of literacy, however, has large positive effects on research, extension and credit spending. Imported HYV's appear to reduce local research spending, while the "borrowable" stock of research investments in other states in similar geo-climate regions appears to stimulate research and extension spending. Finally, as total net cropped area in the district is expanded, research spending expands less than proportionately.[11]. It may be noted that we do not have a significant degree of explanation for changes in rural electrification.

Table 4 : Determinants of Structure : Indian Agriculture

I. Determinants of Public Sector Investments (Class I)

Determinants	Research Expenditures	Extension Expenditures	Changes in Roads	Changes in Electrification	Provision of Agri. Credit
Population Density	—1.465**	.10	.02	—.03**	—.08**
Consumption Gini	1.29*	—.59	.09	—.05	.05
Urbanization Ratio	—.02	—.19*	.07	.02**	.05
Literacy Level	1.95**	2.05**	.01	.12	.21**
HYV's	—.20**	—.01	—.01	—.02	.04**
Borrowable Research	.83**	.52**	.02*	.04	.01
Net Cropped Area	.71**	1.17**	—.28**	—.01	—.01*
Change in Net Cropped Area	.02	.00	.00	.03	.04**
R^2	.583	.719	.182	.044	.768
F	3.07*	56.4	4.9	1.9	73.2

Table 4—*Concld.*

II. Determinants of Long-Run Market Processes (Class II)

	Farm Size	Irrigation Intensity	Net Cropped Area
Population Density	—.24*	.61**	.67**
Consumption Gini	1.25**		1.66*
Literacy Level	.87**		5.00**
High Yielding Varieties	—.10**	—.24**	.11**
Research Intensity	.47**	.32**	.11**
Extension Intensity	—.21**	.32**	
Roads	.08	2.51**	
Rural Electrification	.01	.69**	
Credit Provision	—.71	—.01	
R^2	.671	.562	.550
F	82.7	51.1	45.23

Notes: *Asymptotic "T" > 1.5 and < 2.0
**Asymptotic "T" > 2.0
All values are elasticities computed at sample means.

The second panel of Table 4 provides elasticity estimates for determinants of three long-run investments and market process variables, farm size, irrigation intensity and net cropped area. As with the first panel, all determinant (or dependent) variables are lagged. Additionally, the research intensity, extension intensity, roads, rural electrification and credit provision variables are, in stock and intensity form (as in Table 1) in the second panel. Thus variables that affect the first panel have an indirect effect on the three second panel variables by influencing investment and hence stocks.

Population density, as shown in the second panel, affects farm size negatively and has strong positive effects on irrigation intensity and on net cropped area. Farm size is positively affected by consumption inequality, literacy and research intensity but negatively affected by HYV's, extension and credit.

Since each structure equation contains a population density variables, its elasticity is the total effect of population density. Other variables, such as net cropped area in the research investment equation may have a population induced component as shown in panel two, but this is controlled for so that the coefficients for these variables are picking up effects not associated with the other independent variables.

The population density effects measured in Table 4 can now be "traced" through Table 2 to obtain population induced shifts in output supply and variable factor demand.

Table 5 : Population Induced Shifts in Output Supply and Factor Demand

Elasticities of Population Induced Structure Shifts in:

Wheat Supply	.531	Fertilizer Demand	1.033
Rice Supply	1.080	Bullock Labor Demand	.004
Coarse Cereal Supply	1.300	Tractor Demand	—.008
Other Crop Supply	.575	Labor Demand	.189
Total Crop Supply	.670	Variable Factor Demand	.174

Table 5 reports these population induced structure effects in terms of elasticities. It is clear that they are important. An expansion of population density induces changes in structure that have quite large output effects. A 10 per cent expansion in population density induces structural changes that produce a 6.7 per cent increase in output. The same changes induce a 1.74 per cent change in variable input use. Of course the changes in structure are not costless. Irrigation, expansion of area cultivated, and research and other public investment require real resources. It appears, however, that the Boserupian perspective on change is supported by the data. These induced effects, however, are not sufficiently large by themselves to prevent production per capita from declining when population expands.[12]

IV. Long run Economic effects of a Reduction in Population Growth

We are now in a position to consider the economic effects of a change in population. As noted earlier with reference to Figure 1, these are of three types. Population affects demand. Other things equal a ten per cent decrease in population shifts all demand curves to the left by ten per cent. Population also affects the supply of labor. If we take a long run perspective and presume that the ratio of actively employed workers to total population is constant and that the rural-urban employment ratio is also constant, a ten per cent decrease in population translates into a ten per cent leftward shift in the labor supply function. A third effect is the induced structural effect measured in the previous section.

The analysis of the preceding sections identified only the producer core responses, i.e., the output supply and factor demand responses of profit maximizing farmers. In order to analyze the full effects of population we must model the complete markets depicted in Figure 1.

In order to complete the other side of the product markets, a demand for products structure is required. Similarly in order to complete the missing side of the factor markets, factor supply relationships are required. When these markets are completely modelled, prices themselves can be treated as endogenous to the model, i.e., determined in the markets. With a specification of the complete markets it is possible to calculate the effect of a resource base change (say an increase in irrigation) not only on the product supply and factor demand functions but on the equilibrium prices and quantities in each market.

The demand side of the product markets in India has been estimated by Quizon, Binswanger and Swami, (1982). Using methods similar to those used in estimating the producer core, a system of demand equations was used to estimate demand relationships. The numbers of consumers, i.e., population, as well as incomes and prices determine aggregate demand in the product markets. Since the markets as depicted in Figure 1 show quantities demanded as functions of price only, population, income, international demand, industrial organization in the post-harvest industries, and transport and transactions costs are termed "shifters" for these markets. A reduction in population, for example, shifts the demand curves to the left. This will then result in a decline in prices if no other shifters, including resource base components, change. Of course, as a practical matter, when population changes, the supply of labor to the labor market will also change. Population is thus a shifter variable in the labor market as well.

The specification of the labor market is based on a study by Dhar (1980) and takes into account not only the effects of population change but of migration between regions and sectors as well. Thus when rural wages decline relative to urban wages, workers will migrate from rural to urban jobs. (Dhar, 1980, has estimated these migration responses). The urban-based demand for labor thus becomes a shifter in the rural labor market. A reduction in population growth among urban families can thus have an effect on rural families through rural-urban migration.

The supply side of the animal power market is closely related to the supply of feed and is specified as a value weighted aggregate of the crop supply estimates of Evenson, (1981). Fertilizer and tractor supply elasticities are set at 4.0, reflecting international trade opportunities.

The completion of the specifications of the eight markets allows one to calculate the effects of a large number of shifters on equilibrium prices and quantities in each market. Rural incomes are determined by payments to labor and other owned factors such as bullocks, less payments to purchased chemical and power factors, plus a residual rent to fixed resources (in this case land). Consequently, changes in rural incomes can be inferred from changes in prices and quantities in the seven markets depicted. Furthermore, by adjusting for price changes, a price deflator can be constructed to convert nominal income changes to real income changes.

Quizon and Binswanger (1983) have grouped the Indian population into five groups:

(a) landless and near landless rural households with less than one acre of operated land,

(b) small farmers with one to five acres of operated land,

(c) medium farmers with five to 15 acres of operated land,

(d) large farmers with more than 15 acres of operated land,

(e) urban households.

For each group, consumption weights and income weights were determined. Consumption weights showing the shares of the four agricultural products (and non-agricultural products in the typical consumption basket) were computed. Income weights based on the shares of income from agricultural labor, animal power, land rent and non-agricultural labor in each group's income were also computed.

With this information, it is possible to translate changes in equilibrium quantities in the eight markets (plus residual land rents) into changes in nominal and real incomes per capita and cereal grains consumption per capita for each of the five groups. A reduction in population then can be seen in this short-run model as a combination of a demand shifter, i.e., a leftward shift in the product demand curves and a labor supply shifter, i.e., a leftward shift in the agricultural labor supply curve. The demand shifts will have ramifications in the factor markets because product prices will fall causing a leftward shift in the derived demand for factors. Conversely, the labor force supply shift will have ramifications in the product markets because rising wages will cause shifts in product supply functions.

The structure-induced effects of population growth are computed for North India in Table 5. We can proceed to solve this model by first solving for an initial equilibrium in all eight markets. Note that we also have a bundle of non-agricultural goods being consumed and produced in the model. These goods serve as a "numeraires."

We can express this equilibrium in rate of change form (i.e., we differentiate all equations with respect to time) as a system of eight equations.

This equation system can be expressed as

$$G\ U^1 = K^*$$

where G in a matrix of elasticities, U^1 a vector of equilibrium rates of changes in exogenous variables (prices and quantities) and K^* a vector of shifter type variables. The effects of shifters on rates of change in endogenous variables can be solved as:

$$U^1 = G^{-1}\ K^*$$

Table 6 reports the effects of a simulated ten per cent decrease in population growth on the endogenous variables of the system including real income effects for the five population groups. The induced-structure or "Boserupian" effects are calculated separately. In addition the effects of a 10 per cent increase in the "technology base" (i.e., a 10 per cent increase in the expenditures on research and extension and HYV in production) in irrigation intensity, and in areas under cultivation are shown for comparative purposes.

The simulation should be interpreted as *short-run* consequences of population change, technology, irrigation and land investment. The basic elasticities in the model are estimated with methods that do not attempt to distinguish between short-run and long-run effects and given their nature it seems reasonable to interpret them as short-run elasticities.

I have calculated five sets of population effects. The first is termed a "Malthusian" calculation. In this simulation it is supposed that over an extended period policies are put in place that reduced population *and* labor force growth such that at the end of the period both the size of the population and the labor force would be 10 per cent lower than in the absence of the policies. The simulation thus takes into account the reduction in demand for products and in the supply of labor.

Table 6 : Simulated Economic Effects of Population Growth Decline, Technology Investment, Land Investment and Irrigation Investment—North India

Effect on:	10% Decline in Population				10% Increase in			
Real Per Capita Income	Malthusian	Boserupian	Total	Rural Landless only	Urban only	Technology Base	Land Base	Irrigation Base
(a) All Groups	7.77	—2.80	4.97	2.18	.83	.26	2.60	1.78
(b) Rural Landless Households	14.72	—8.36	6.36	7.68	1.69	1.12	6.64	6.58
(c) Small Farm Households	11.82	—.59	11.29	3.31	—.15	1.10	—.11	—.30
(d) Medium Farm Households	6.78	.39	7.17	.73	—1.11	—1.35	—3.19	—4.18
(e) Larger Farm Households	.69	1.44	2.13	—1.93	—13.45	—3.54	—11.26	—13.52
(f) Urban Households	7.06	—1.47	5.59	1.06	10.24	3.36	13.01	12.52
Agricultural Employment	—4.80	—2.95	—7.75	—1.95	—2.29	—.44	—.30	—.07
Real Agricultural Wages	12.94	.38	13.32	7.33	—.66	.22	—1.88	—.10
Real Land Rent	—25.18	40.26	15.08	—5.42	—7.40	—10.20	—31.45	—38.15

This first calculation is of considerable interest because it shows that the effects of these policies are large and *progressive* in terms of their distribution. Real incomes of the population at large rise by 7.77 per cent. For the poorest group, landless laborers, real incomes rise by 14.72 per cent, while for the relatively high-income, large farmers, real incomes do not rise appreciably. The 10 per cent reduction in labor supply produces a 4.8 per cent reduction in agricultural employment and a 12.84 per cent rise in real wages. Real land rents (calculated as a residual in this model) actually fall by 25.18 per cent. It is this rise in real wage and decline in returns to land holdings that produce most of the progressiveness in the real income consequences.

The second column is the simulated Boserupian effects associated with the decline in population. Because population density is lower, population density induced effects (Table 5) are lost. These Boserupian effects are also important. When they are considered, the gain in real income for the population as a whole falls by 2.8 per cent so that the net gains are 4.97 per cent. The Boserupian effects are themselves progressive in nature, i.e., an increase in population density induces investments that favor the poor. Their loss is thus regressive. In these calculations their loss reduces the 14.72 per cent gain by the landless by 8.36 per cent leaving a net gain of 6.36 per cent. After adjusting for Boserup effects, however, we still observe that a decline in population has important and progressive effects. The rural landless and small farmers gain most.

I have also simulated two rather specialized population growth effects in columns 4 and 5 in the table. In these I am simply reducing the population of a particular group by 10 per cent. (There are no Boserup effects). One way to visualize this simulation is to interpret it as a reduction in the population and labor force due to a labor recruitment program for work in Middle Eastern countries. Column 4 shows that if this recruitment is directed only to the landless agricultural worker group it has a large and progressive effect on real incomes. The landless agricultural worker group gains more from this specialized effect than from the more general population reduction. (Actually, if only workers were recruited while families are left behind real wages would rise even more).

Column 5 shows the effect of recruitment from the urban population only. Here the effect on real incomes is smaller but is probably still progressive. (The calculation assumes that when population is reduced per capita income remains constant).

For comparative purposes I have also calculated the effects of investments in technology, land expansion and irrigation investment. In these simulations we are not measuring Boserupian effects. These can be looked upon as policy options available as alternatives to population policy. Each option has very different costs and these costs are not considered in the simulation. For example, a ten per cent increase in the technology base (the HYV-Research stock) is much less costly than a ten per cent expansion in the land or irrigation stock. (In fact only about 1/40 as costly).

Interestingly all three forms of investment have similar effects. They lower food prices, raise real wages and reduce land rents (note that these land rents do not include rents to new land or irrigation, we are presuming public ownership of these rents). Urban consumers benefit most from these programs and large farmers lose most (provided they do not collect newly created rents from the investment).

V. Concluding Comments

The relationship between development and fertility is complex. This paper attempted to measure a major part of this relationship and has ignored or set aside another part. We have produced evidence that population growth has important effects not only on the demand for goods and the supply of labor but through induced structure or Boserupian effects as well. The simulations reported show these effects to be important. In some sense one can say that the Boserupian effects constitute something of an antidote to the negative and regressive effects of population growth on real income. Our simulations show that real incomes will fall less when Boserupian effects occur and that the declines will be less regressive as well.

The approach taken in this paper has also attempted to look at the role of non-Boserupian policy effects and has shown that policy makers can invest in technology, land expansion, irrigation, schooling, electrification, etc. and offset the negative effects of population growth if they choose to do so. India has in fact chosen to do so, as have most other countries, and as a consequence real income have not fallen over the past two decades or so. The simulation model is useful in providing a basis for comparing the costs of alternative policies designed to achieve real income objectives.

We do not have adequate cost data to make a full comparison between the costs of achieving a real income goal through population policies or investments in technology and irrigation. Our simulations do make it clear that a given real income objective can be achieved at much lower cost through technology base investment than in land expansion or irrigation investment. It would appear likely that an effective family planning program may achieve these goals at an even lower cost.

We have thus concentrated in this paper on the impact of population on economic development outcomes. We have set aside the reverse relationship, i.e., the impact of development on population growth primarily for reasons of tractability. Certainly the reverse relationship exists. As wages, prices and read incomes change, fertility changes in response. In

general, the bias from neglecting this in the simulations offered here runs in the direction of conservatism regarding policy actions. A policy to intervene actively in household-decision making so as to achieve a reduction in fertility (through education, subsidized contraception, etc.) produces increases in real wages and real incomes in our model. These increases in real wages will produce further incentives to reduce fertility if they are not biased against women. A rise in the real value of time for women reduces fertility, while a rise in the real value of time for children has an opposite effect. On balance we would expect that the second round effects of a fertility reduction programme would reinforce the first round effects thus lowering the costs of obtaining a fertility reduction.

A full treatment of the issue awaits further research.

References

Arndt. T., D. Dalrymple and V. W. Ruttan, (eds.) *Resource Allocation and Productivity in National and International Agricultural Research,* University of Minnesota Press, Mpls., 1977.

Asian Development Bank, (1977) : *Asian Agricultural Survey,* 1976 : *Rival Asia : Challenge and Opportunity,* Manila, April.

Binswanger, Hans P., *The use of Duality Between Production, Profit and Cost Functions in Applied Econometric Research,* Economic Department, International Crops Research Institute for the Semi-Arid Tropics, Occasional Paper No. 10, 1975.

Boserup, Ester, *The Conditions of Agricultural Growth,* Allen & Unwin, 1965.

Boserup, Ester, *Population and Technical Change,* University of Chicago Press, 1981.

Diewert, W. E., "Functional Forms for Profit and Transformation Functions," *Journal of Economic Theory,* 6 (1973) : 284-316.

Evenson, R. E., "The Green Revolution in North Indian Agriculture : Ex Post Assessment," Yale University, mimeo, 1982.

Evenson, R. E., *Technical Access and Factor Markets in Agriculture,* Paper presented at the Agricultural Development Council Workshop on Technology and Factor Markets, Singapore, August 9 and 10, 1976.

Evenson, R. E., M. Ann Judd, and James K. Boyce, "Investing in Agricultural Supply," Yale University, Economic Growth Center Discussion Paper 442, 1983.

Evenson, R. E., and Y. Kislev, "Research and Productivity in Wheat and Maize," *Journal of Political Economy,* 81 (1973) : 1309-1329.

Krishna, Ray, *Unemployment in India,* Agricultural Development Council Reprint Series, 1975.

Lau, L. J., Some Applications of Profit Functions, Memorandum No. 86A and 86B. Research Center in Economic Growth, 443, Encina Hall, Stanford University, Stanford, California, 1969.

Mellor, John W., "The New Economics of Growth : A strategy for India and the Developing World," Ithaca, Cornell University Press, 1976.

Quizon, J. B. and H. P. Binswanger, "The Distribution of Agricultural Incomes in North Indain Agriculture—A Model," The World Bank, mimeo, 1982.

Sidhu, S. S., "Relative Efficiency in Wheat Production in the Indian Punjab," *American Economic Review,* 64 (September 1974) : 242-250.

Yotopoulos, P. A. and Larry T. Lau, "A Test of Relative Economic Efficiency," *American Economic Review,* 53 (*March* 1973) : 214-223.

NOTES :

[1].See Boserup (1965, 1981) for the treatment of population pressure.

[2].See Binswanger (1975), Diewert (1973), Lau (1969), and Yotopolous and Lau (1973.

[3].Formally let:

(1) H (Y, X, Z=0 be the transformation function by which a vector of variable factors X and a vector of fixed factors (including farm structure) Z are transformed to a vector of outputs Y.

Then the maximized profits function will be:

(2) $\Pi^* = (P_i , P_j , Z)$

where the P_i are output prices and the P_j factor prices.

Then Hotelling-Shephard lemma shows that:

(3) $\partial \Pi^* / \partial P_i = Y_i = Y_i (P_i , P_j , Z)$

are the output supply equations and

(4) $\partial \Pi^* / \partial P_j = X_j = X_n (P_i , P_j , Z)$

are the factor demand equations.

[6].See Quizon and Binswanger (1982) for a discussion of this model.

[7].See Evenson (1982) for further details of the data set.

[8].See Evenson (1976) and Evenson and Kislev (1973), for a treatment of the role of climate in technology diffusion.

[9].See the Asian Development Bank's (1977) Survey for a discussion of these exhibits. Also Mellor (1976).

[10].See Krishna (1975), Sidhu (1974).

[11].See Arndt, *et al*, (1977), Boyce and Evenson (1975), Evenson (1968), Evenson and Jha (1973), Jha and Evenson (1974) and Mo
Jha and Evenson (1973) for previous estimates of research productivity in India.

[12].Few previous studies have examined the determinants of net cropped area. See Yamaguchi and Binswanger (1975) for
attempt to do so.

[13].In recent papers, Judd, Boyce and Evenson (1983) report an investment analysis for research consistent with these results.

[14].See Asian Development Bank (1977) and Bardham and Srinivasan (1974) and Mellor (1976).

MGIPCBE—S4—5 RGI ND/84—28-8-87—500.

©

PRG. 466. (N)
500—1984 (DSK II)

Price: Inland Rs. 37.00 *or Foreign* £ 4.32 *or* $ 13.32

PRINTED IN INDIA BY THE MANAGER, GOVT. OF INDIA PRESS, COIMBATORE-641 019
AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110 006
1987